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Investing for the future of Rovigo:

the cultivation of therapeutic hemp

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ABSTRACT

La provincia di Rovigo sta affrontando una crisi socio-economica da diversi anni. All'interno della regione Veneto, essa rappresenta il territorio più svantaggiato, insieme a quello di Belluno. I valori relativi alla sua situazione economica e sociale sono una chiara dimostrazione di questo fatto e rendono evidente la necessità di un intervento. Gli indici demografici rilasciati dall'ISTAT, la rappresentano come una provincia statica, all'interno della quale non ci sono relazioni di dinamismo che potrebbero portare uno sviluppo locale. La natalità è tra le più basse, la mortalità, l'età media, e l'indice di vecchiaia sono invece più alte rispetto alla media nazionale. Manca infatti una popolazione lavoratrice giovane, capace di portare innovazione all'interno dei diversi settori. Di conseguenza, i fattori economici, come il livello di occupazione o il reddito medio, non sono favorevoli e la popolazione preferisce spostarsi in altre località per vivere. Quello di cui ci sarebbe bisogno è un investimento in nuovi e promettenti settori. Rovigo, di fatto, possiede un grande potenziale per la presenza di un importante centro di ricerca sull'agricoltura, il CREA. Qui, da oltre vent'anni viene studiata la canapa terapeutica ed è dove vengono prodotte le talee che sono mandate poi allo Stabilimento Farmaceutico di Firenze, dove vengono trattate per avere il prodotto finale. A tal proposito, un'opportunità per Rovigo sarebbe investire nella creazione di una filiera legata alla produzione e trasformazione della cannabis medicinale. Secondo una comparazione realizzata tramite l'analisi di esempi da diverse parti del mondo, come Israele, Victoria (Australia), U.S. e Lesotho (Africa), i risultati a Rovigo potrebbero essere soddisfacenti. Aumenterebbero i ricavi, gli investimenti nazionali e internazionali, ci sarebbero maggiori posti di lavoro e sarebbe soddisfatta una domanda di prodotto che ad oggi viene coperta dalle importazioni dall'Olanda. Con la sola coltivazione di 2 capannoni di 1000m² ciascuno, la produzione saturerebbe il mercato Italiano. Il problema principale, tuttavia, è rappresentato dalla legislazione. Questa infatti impone dei limiti, rendendo quasi impossibile la coltivazione di canapa terapeutica e lasciando milioni di pazienti senza cure. Quello di cui c'è veramente bisogno è un aggiornamento delle normative e la diffusione di una maggiore consapevolezza riguardo questa pianta, sia all'interno della società che della politica. Oltre che alle proprietà terapeutiche, la canapa è rinomata per le sue caratteristiche riconducibili ai concetti di economia circolare e sostenibilità. Ripulisce il terreno da materiali inquinanti, assorbe più anidride carbonica di quanta ne emette, ha bisogno di

poca acqua, è resistente ai fenomeni atmosferici e attira molta biodiversità. Per di più, ognuna delle sue parti, dal fiore, alle foglie, allo stelo, ai semi, può essere utilizzata per ottenere un prodotto finito. Grazie a queste caratteristiche, è possibile sfruttare la pianta in diversi modi. Per questo motivo Rovigo, soprattutto nel mentre che non cambia la legge, dovrebbe iniziare a pensare ad un piano strategico industriale che va ad utilizzare a proprio favore queste potenzialità

Index

1. Introduction

Hemp[1] is an excellent tool we have available for the economy, the environment and to mitigate to climate change. It is an almost inexhaustible resource capable of replacing petroleum derivatives and drastically reducing CO_2 levels, perfectly matching the principles of the circular economy.[2] It can be used for a lot of purposes: green building, cosmetics, texture, paper, food, and, not least, thanks to its medicinal properties, for millions of patients suffering from the most disparate and often highly disabling diseases. In this thesis, we will focus on this last possible use, specifically trying to understand if its industrialization could become a developmental input for the province of Rovigo. I decided to base my research on this territory because it is among the most disadvantaged territories of Veneto region, but at the same time possesses a potential to improve its situation. To demonstrate the opportunities created by therapeutic hemp industries, I will bring some examples of countries that implemented such projects, showing also the difficulties encountered. Further support is given by some interviews conducted, from which we can better understand what are the opinions of people who have worked and are working in this sector. The conclusions will put together all the information given during the chapters and outline some suggestions for further interest in this topic.

When we talk about hemp in Italy, we still find a strong dichotomy in its function: it is often associated much more with the role of a psychotropic substance and leisure, rather than that of health or other uses. However, since 1997, a ministerial decree has provided for the possibility of prescribing cannabinoid medicines not available on the national territory. Despite this, the bureaucratic process requires lengthy and discouraging times for patients. Parallel to the national legislation, some regional laws have been introduced to supply cannabinoid-based medicines paid for by the ASLs (*Azienda Sanitaria Locale* - local health company). The crucial issue is that medicines containing cannabis extracts have so far been imported from the Netherlands, with huge costs for the ASLs (or for the patients themselves, if the regions do not have the legislation we

[1] Note that "hemp" is translated with "canapa" in a general sense, considered as the plant that can be used to obtain raw materials of different kind. However, in this thesis I will use "cannabis" and "therapeutical/medicinal hemp" as synonyms.

[2] A.T.M.F. Ahmed et al, Hemp as a potential raw material toward a sustainable world: A review, ScienceDirect, 2022

have just mentioned). In light of this economic problem, and probably also in the wake of the growing global phenomenon of the recognition of this type of treatment, the Ministries of Defence and Health proclaimed the beginning for the Italian production of medical cannabis. The cuttings are produced in the CREA (*Consiglio per la Ricerca in agricoltura e l'analisi dell'Economia Agraria* - Council for research in agriculture and the analysis of agricultural economics) of Rovigo, a research institution placed under the protection of the Ministry for Agricultural Policies that has been involved in the study of cannabis since 1995. The CREA is the owner of all the varieties of hemp registered in Italy. This institution was able to develop CBD-rich strains, and the work was very fruitful as they were among the few in the world to make this kind of breeding. Since it became legal to experiment with THC, with Law 309/90, the CREA of Rovigo and the Military Pharmaceutical Chemical Plant of Florence are the only places in Italy where it is possible to legally grow cannabis plants that exceed the THC limit of 0.2 per cent. Furthermore, the entire cannabis production chain is under the control of AIFA (*Agenzia Italiana del Farmaco* - Italian Medicines Agency), which controls, records and regulates all activities in collaboration with the Ministries and the United Nations.

The biggest problem of today is that, apart from SCFM, the processing industry is missing. The cultivation of hemp would be able to create new local supply chains, influencing the local economy. This could be the chance for territories like Rovigo to set up new enterprises. In Italy, there are hundreds of small companies fragmented throughout the national territory, not very structured, and unable to obtain production efficiencies. And it would also be important not to ignore the history and vocation of the territories: before prohibition due to many consequent laws, that we will investigate later, cannabis was cultivated with excellent results in the Po Valley. It would be absurd to want to start its reintroduction in areas where it has never been consistently cultivated. Instead, restoring outdoor historic areas with the new breeds or to start an indoor cultivation with the most innovative species, could lead to greater benefits.

Thus, thanks to the demographic and economic analysis of the territory of Rovigo and the presentation of another case study, in the end I, will try answer to my research question: would the industrialization of medicinal cannabis in the province of Rovigo bring a development in the territory?

2. Medicinal Cannabis: a presentation

The uses of the hemp plant are so many and cross between traditional products and new commodities. My investigation will focus on one of the hundreds of uses that hemp can satisfy. But before zooming in on the therapeutic properties, I would like to give a general overview of the results that this plant can obtain. This resource, given its characteristics, should be subjected to greater scientifical interest and investments. Among all the uses, we can enlist some general categories:

- The food sector uses the seeds for their high content of proteins, omega-3 and omega-6, all excellent allies of health, both for humans and animals[3];
- The use of fibre for the production of paper, with advantageous properties such as the high productivity in cellulose, the low percentage of lignin, the already white colour that does not require the use of chemical compounds[4];
- Construction, which sees hemp as an absorbent material of carbon dioxide, an excellent insulator, and favouring ventilation which contributes to reducing the energy costs of maintaining temperature and humidity[5];
- Bioplastics, for which creation, based on different formulas, can be produced products with different qualities of resistance, recyclability, and biodegradability[6];
- The automotive sector, where hemp could reduce the weight of cars, making them more resistant than usual metal bodies[7];
- The production of biomass fuels such as ethanol and to obtain biodiesel of natural origin[8];
- The textile sector uses fibre to produce clothing that remains cool in summer and warm in winter, in addition to antibacterial and anti-soot properties, but also for fabrics, furnishings, ropes, and carpets[9];
- The oil squeezed from the seeds is widely used in cosmetics for its anti-inflammatory and regenerating properties and for maintaining the good health of the skin[10];

[3] Cannabis e Alimentazione: perché parlarne | Cannabiscienza
[4] 10 potenziali usi per la carta di canapa - CannaConnection
[5] Costruire con la Canapa: proprietà e uso nella bioedilizia moderna (immobilgreen.it)
[6] Il ruolo della canapa nel packaging | Hera Comm (gruppohera.it)
[7] La fibra di canapa per il futuro del settore delle auto - Canapa Industriale Canapa Industriale
[8] Biodiesel dalla canapa. - Rinnovabili.it
[9] Canapa Tessile, La Fibra Ed Il Tessuto» Vesti La Natura

- Lastly, the flowers are transformed for therapeutic purposes to treat or alleviate symptoms of various diseases, including serious ones[11].

As already anticipated, it is precisely on this ultimate point that I based my research. The following paragraph will deal with the history that links hemp with its therapeutic uses. It will give a foundation to the statement that sees therapeutic hemp as a powerful investment for the future.

2.1. Historical background

Cannabis sativa L. is among the most ancient plants that have been grown and exploited by the humankind for its copious properties and uses. This species is an annual flowering herb that can be divided into two main subspecies, both wild and cultivated: *Cannabis sativa*, taller and more fibrous; *Cannabis indica*, shorter and more psychoactive; but a third putative species can be cited as well, *Cannabis ruderalis*, that is only wild. Nowadays a classification based on the chemotype depending on the content in cannabinoids is generally preferred. Thanks to this grouping, it is possible to identify the different content of psychoactive cannabinoids and non-psychoactive cannabidiol, a fundamental characteristic of the pharmacological uses of cannabis.[12] The following paragraph will give an account of the uses made during the centuries with cannabis with a high percentage of tetrahydrocannabinol (THC) in different parts of the world.

2.1.1. China, India, Mediterranean Sea and Europe in ancient times

Cannabis can be considered a medicine with a pluri-millennial history. Its use originated in Central Asia, or Western China, that employed it for its healing properties. The first documented case of its application dates back to 2800 BCE when it was listed in the pharmacopoeia "*Pen-ts'ao Ching*", compiled by Emperor Shen Nung, who is regarded as the father of Chinese medicine. Many studies suggested cannabis for more than one hundred disturbs, including rheumatic pain, intestinal constipation, disorders of the female reproductive system, malaria, and others.[13] Another Chinese scholar to

[10] Cosmetici alla canapa in Europa e Italia, normativa e spunti - (farmagalenica.it)
[11] Cannabis terapeutica, elenco delle patologie trattabili - CLINN
[12] Pisanti S, Bifulco M., *Medical Cannabis: A pluri-millennial history of an evergreen*. J Cell Physiol. 2019; 234:8342–8351. https://doi.org/10.1002/jcp.27725
[13] Zuardi A. W., History of cannabis as a medicine: a review, Sao Paolo, 2005.

mention is Hua Tuo (140-208 CE), the founder of Chinese surgery, who is cited in the "*Ho Han Shu*" for his performance of surgical operations without causing pain in his patients thanks to the administration of *máyóu*, an oil made by a mixture of cannabis, wine and another plant, *Datura*.[14] In addition, there are very few proofs in the ancient Chinese texts regarding cannabis psychoactive properties, with the only exception of hallucination events registered if too much cannabis was ingested. Still, today, the word *cannabis* in Chinese is composed of two ideograms, of which the first means "cannabis" and the second "numb".[15] This demonstrates how, even after millennia, it kept its notoriety.

In China, the medical use of hemp never reached the importance it did in India. In India, hemp was widely disseminated, both as a medicine and as a recreational drug. Such a broad diffusion may be because it maintained a straight association with religion, which assigned sacred virtues to the plant.[16] The ritual consumption of cannabis is described in numerous Sanskrit texts, including the "*Veda*", dating back to 1000 BCE. It speaks about a substance sacred to the god Shiva used for religious and mystical ceremonies. The "*Atharva Veda*", a collection of sacred texts by an unknown author, mentions cannabis as one of the five consecrated plants, reporting it as capable of giving happiness and freedom.[17] Moreover, as described in other later Vedic texts such as the "*Susrita Samhita*," one of the foundational texts of Ayurvedic medicine (about 800 BCE), and many others, cannabis was used for its analgesic, anaesthetic, antispastic, anticonvulsant, antibiotic, tranquillizer, anti-parasite and diuretic properties.[18] People consumed it in the form of *charas*, the resin that covers female flowers, *bhang*, which consists of seeds or dried leaves, or *ganja*, prepared with the flowers.[19] All these forms of preparation guaranteed the presence of active cannabinoids.[20]

During the centuries, the medical use remained very intense in India and eventually spread to the Middle East and Africa. Between the II and I centuries BCE the repeated

[14] Catania M., *Il futuro è verde canapa*, Diarkos editore, Varese, 2019, p. 237- 240.
[15] Pisanti S, Bifulco M., ibid.
[16] Zuardi A. W., ibid.
[17] Catania M., ibid.
[18] Pisanti S, Bifulco M., ibid.
[19] Aroonsrimorakot, S., Laiphrakpam, M., et Metadilogkul, O., Social, religious, recreational and medicinal usage of cannabis in India and Thailand. *Interdisciplinary Research Review*, *14*(4), 43–50, 2019. Retrieved from https://ph02.tci-thaijo.org/index.php/jtir/article/view/221554
[20] Zuardi A. W., ibid.

migrations of the nomadic tribes of Scythians from Central Asia favoured its diffusion also in the Mediterranean basin, Europe and the Middle East.[21] Scythians, as documented by the Greek historian Herodotus form Halicarnassus (484-425 BCE), used hemp mainly during funeral proceedings and in banquets through fumigations, relaxing saunas and as fibre[22] (Herodotus Book IV: 74)[23]. In Arabia, well-known physicians mentioned cannabis in their medical compendiums, like in "*Avicenna*", in the year 1000 CE, a Muslim text that comments on its use as a diuretic, digestive, anti-flatulent, and to soothe the pain of the ears.[24]

In Europe, initially, the most spread adoptions were as fibre for ropes and sailcloth, whereas seeds were consumed as food. Only in the first century CE, we find writings about its use in medicine.[25] Dioscorides (40-90 CE) presented in his "De Materia Medica" one of the oldest depictions of the plant and recommends it for earache, edema, jaundice, and other ailments. In the same period Pliny the Elder (23-79 CE), in his "*Naturalis Historia*", described cannabis in its positive and negative properties. He recommended its use to treat migraines, to extract worms and parasites from the ears, to cure gout and constipation, but with the risk to causing impotence in men and headache. Then, the most famous physician in the Roman world, Galen (129-216 CE), mentioned cannabis as a remedy for flatulence, earache, and pain in general.[26] Nevertheless, excessive consumption of hemp seeds, which were used in Roman banquets to induce relaxation, hilarity, and euphoria, could stimulate thirst, sluggishness and difficulty to digest.[27]

2.1.2. From the Medieval Age to modern times

Taking a big step forward in time, in the first part of the Middle Ages, the plant continued to pursue mystical and therapeutic purposes. In 1200, Pope Giovanni XXI, also a physician, inserted cannabis into a medical treatise, indicating it as a remedy for otitis. But then, the growth of ecclesiastical power linked to Christianity managed to cancel numerous cults and rites, including the use of cannabis, banned in various parts

[21] Cannabis terapeutica tra storia e futuro - Cannabis Terapeutica Cannabis Terapeutica
[22] Pisanti S, Bifulco M., ibid.
[23] Erodoto di Alicarnasso, Le Storie, Libro IV, 74, 429 BCE.
[24] Zuardi A. W., ibid.
[25] Pisanti S, Bifulco M., ibid.
[26] Cannabis terapeutica tra storia e futuro - Cannabis Terapeutica Cannabis Terapeutica
[27] Pisanti S, Bifulco M., ibid.

of Europe during the Holy Roman Empire.[28] Thus, the "civilization" of pagan culture, affected its progressive disappearance from the European continent.[29] Furthermore, the repression by the Inquisition courts began, which resulted in the papal bull of Pope Innocenzo VIII, which, in 1484, prohibited its use for churchgoers. Cannabis was later reintroduced for medical purposes by travelers returning from Asia and Africa.[30]

In the Americas, its use probably began around the 16th century in South America, where it was brought by African slaves.[31] In 1621, the English essayist Robert Burton, in "The Anatomy of Melancholy", recommended it for the treatment of depression for its sedative effects. We had to wait until the beginning of the nineteenth century to see the birth of a scientific interest. This happened with William B. O'Shaughnessy, an Irish physician who systematized the knowledge of the medicinal properties of this plant. In 1839 he described the uses and benefits of cannabis, learned in India, supported by a series of experiments performed first on animals and then on his patients, for diseases such as rabies, rheumatism, epilepsy, tetanus, defining cannabis as "the perfect anticonvulsant remedy" (from "*On the preparations of the Indian hemp, or gunjah*").[32] Another crucial contribution is the one given by Jacques-Joseph Moreau, a French psychiatrist, who used cannabis administration on his mental patients, observing that it was helpful to increase appetite, facilitate sleep and calm them down.[33]

The medical use spread from England and France, reaching out to all Europe, from the Netherlands, Spain, Portugal, Germany, and North America. In 1854 cannabis became listed in the U.S. Dispensatory, officially legitimizing its medicinal use. In 1860, the first clinical conference about cannabis took place in America, organized by the Ohio State Medical Society.[34] During this conference, Dr Fronmueller explained the clinical use of cannabis as an analgesic treatment for inflammatory and neuralgic pain in hundreds of patients.[35] The second half of the 19th century was prosperous because of

[28] La cannabis nel tempo: origine, storia e utilizzo - CLINN
[29] Cannabis terapeutica tra storia e futuro - Cannabis Terapeutica Cannabis Terapeutica
[30] Catania M., ibid.
[31] Zuardi A. W., ibid.
[32] Cannabis terapeutica tra storia e futuro - Cannabis Terapeutica Cannabis Terapeutica
[33] Pisanti S, Bifulco M., ibid.
[34] Zuardi A. W., ibid.
[35] Affinity - Your Place For WellnessHistory of Cannabis (affinitywellness.net)

over 100 scientific articles published in Europe and the United States about the therapeutic value of cannabis.[36]

In this historical context, we should also emphasise the role of Italy, which was leading the experimentation of cannabis. Carlo Erba, an Italian pharmacist founder of the famous Italian Pharmaceutical Company, and Giovanni Polli, physician and Director of the scientific journal "*Annals of Chemistry applied to Medicine*", imported in Italy the first experimentation on cannabis. In a distinguished experiment completed in Milan on 19th June 1847, Polli, together with Francesco Viganò and Pietro Mordaret, tested as volunteers the effects of the plant in the presence of a large group of other physicians and scientists. They pictured the results anonymously, where the experimenters represented the letters A, B, and C. "Cannabis experiences" became very popular among scientists and doctors, and other experimentations were made, observed and accurately registered.[37]

The peak utilization of cannabis in Western medicine was in the late 19th and early 20th centuries. In the beginning of the 20th century, the medical indications of cannabis were summarised in three areas in the "*Sajous's Analytic Cyclopedia of Practical Medicine*" (1924): sedative or hypnotic, analgesic or for other uses such as improvement of appetite and digestion, anorexia, gastric neuroses, cholera and many others.[38]

Yet, the history of the definitive decline of cannabis took place in the United States when in 1937 the Congress passed the Marihuana Tax Act, closing a series of prohibitionist acts promulgated in individual states. Under the new laws, the use of cannabis in medicine became a virtual halt. In addition, there was not a distinguishment between cannabis with psychotropic properties or species used for hemp products. In 1941, they dropped it from the National Formulary and Pharmacopoeia[39], the most comprehensive source for medicine quality standards in the world. It contains standards for medicines, dosage forms, drug substances, excipients, biologics, compounded preparations, medical devices, dietary supplements, and other therapeutics.[40]

[36] Zuardi A. W., ibid.
[37] Pisanti S, Bifulco M., ibid.
[38] Zuardi A. W., ibid.
[39] Mikuriya T.H., Marijuana in Medicine, San Francisco, 1969
[40] What is a USP Monograph

On the side of scientific research, 1964 represents a considerable step onward: Gaoni and Mechoulam identified the chemical structure of THC, which contributed to a proliferation of studies about the active constituents of cannabis.[41] After the second half of the 70s, the number of publications decreased for the following two decades.[42] Only in the 90s the studies reached another peak, especially since the endocannabinoid system, its receptors and the endogenous molecules, named endocannabinoids, were finally discovered.[43] Today cannabis in many countries is gaining more and more attention as a treatment for the most disparate diseases. Modern methods of scientific investigation have allowed us to validate many of the therapeutic effects discovered in the past and find new ones. The future of research, which we hope will be less and less tied to political choices, will focus on the endocannabinoid system, considered a perfect drug target, or on cannabinoids encapsulated in nanoparticles to have maximum control over cannabis administration.[44]

Summarizing what we have just read, we can affirm that cannabis had a crucial role in the history of many countries. Some territories consciously deepened its medicinal properties, realizing they could use it for numerous purposes. Others used it with more religious beliefs but were still aware of the effects on the human body and mind. It is thought-inspiring to create a comparison with the uses that are made of this plant today. We have seen that cannabis was negatively labelled mostly for political issues that brought to a situation of neglect and denial of its efficient properties. Political decisions have limited the cultivation of an almost unique plant usable in the productions I previously mentioned. It happened in favour of investments essentially in the oil economy, concentrating power in the hands of a few. Hemp, on the other hand, would be affordable and sustainable for the economy, society and the environment. To see the bright side, studying the history of this plant and developing critical thinking about it, is a good starting point for bringing changes in beliefs and legislation. Realising that the prohibition of this plant for reasons far from what they have tried to make us believe must be a stimulus for present and future generations to fight to take a step backwards.

[41] Gaoni Y., Mechoulam RJ. Isolation structure and partial synthesis of an active constituent of hashish. J Am Chem Soc. 1964;86:1646-16477.
[42] Catania M., *Il futuro è verde canapa*, Diarkos editore, Varese, 2019, p. 243.
[43] Pisanti S., Borselli C. et al, Antiangiogenic Activity of the Endocannabinoid Anandamide: Correlation to its Tumor-Suppressor Efficacy, Journal of Cellular Physiology, 2007.
[44] Cannabis terapeutica tra storia e futuro - Cannabis Terapeutica Cannabis Terapeutica

The next section of the paper will precisely focus on the history of the legislation in Italy and subsequently in the Veneto region, illustrating the limitations and difficulties that farmers, entrepreneurs and sick patients face today regarding therapeutical cannabis.

2.2. Environmental benefits and disadvantages

After listing what are all the uses that hemp can satisfy and the history of its therapeutic potential, now, we will see what characteristics define it as a sustainable plant. One of the first sustainable characteristics that it is necessary to point out is that it is qualified to be used in all parts. We have already found the results from flowers, seeds, leaves, and stems. All parts of the plant can be potentially turned into a final product. Therefore, the circular economy is the model of sustainable development to which this crop is naturally suited. In agriculture, it lends itself to reducing the environmental impact of anthropogenic activities and decreasing the consumption of soil and water, comparing it with many other arable crops. It is profitable for farmers, both because it lends itself to rotations and as well as to replace surplus or low-paying crops. In a nutshell, it can help mitigate climate change and desertification alongside preserving biodiversity, and at the same time, it could lead to economic and social development. The following lines will present the sustainable specificities to which I am referring.

As we already mentioned, hemp represents an excellent plant to absorb CO_2 because it can capture atmospheric carbon twice as much as most ecosystems through photosynthetic activity.[45] Moreover, the products that originate from it have a long life cycle and, for example, in the case of architecture, can provide carbon-negative biomaterials for construction. Specifically, its stem is composed of about 45% of absorbed atmospheric carbon during photosynthesis, and the biomass produced in one hectare can store up to almost 15 tons of CO_2. This value is higher than forests that,

[45] A.T.M.F. Ahmed et al, Hemp as a potential raw material toward a sustainable world: A review, ScienceDirect, 2022

depending on the number of years of growth, the climatic region, and the type of trees, typically capture 2 to 6 tons of carbon dioxide per hectare per year.[46]

But the absorbing capabilities also work for other substances, making the plant particularly suitable for reclaiming soils polluted by heavy metals, stored mainly in the leaves and not in the fibres. Hemp can grow in sewage sludge, leading to a decrease in the concentration of zinc, copper, nickel, lead, chromium and cadmium, and organic pollutants. Generally, there is no reduction in biomass (indeed) that can be used, for example, in the production of composite materials or for energy production in thermal power plants. Its cultivation in polluted territories could avoid the commercialization of contaminated food while ensuring a contribution to agricultural income. In radioactive territories, hemp has a high *caesium* absorption factor, accumulating it in the roots and not affecting the quality of the fibres or the oil.[47] Thus, we can affirm that hemp could serve as a phytoremedial agent to remove toxic metals from contaminated sites, and as yield high biomass, which could be used to produce bioenergy.[48] From a soil phytodepuration point of view, hemp is just one of the hundreds of plants with these properties. However, it is always advisable to evaluate the cost of the operation and the performance of other plants, case by case, and verify the possible ways of immobilization of the contaminants once removed. In any case, preventing heavy metal pollution remains the best method to protect the environment and is critical because cleaning contaminated soils is extremely expensive and challenging.[49]

The consequence of this recent rediscovery of hemp sustainable characteristics renewed the interest in its cultivation. Focusing on farming aspects, it allows the diversification of crops, beneficial for improving environmental and economic performance. It is a spring harvest with reduced planting costs, which favours the increase in the yield of the next cereal. If introduced between two winter crops, hemp hinders the spread of pathogens and the growth of weeds, given its shading and "suffocating" power. It leaves

[46] La canapa alleata nella lotta ai cambiamenti climatici: assorbe più anidride carbonica delle foreste (agrifoodtoday.it)
[47] Viganò E., Le filiere e il mercato della canapa in Italia: un'opportunità per le imprese agricole, "Colture innovative: il caso della Canapa 21-22-23 settembre 2020"
[48] Kumar, S., et al. (2017). *Cannabis sativa*: A Plant Suitable for Phytoremediation and Bioenergy Production. In: Bauddh, K., Singh, B., Korstad, J. (eds) Phytoremediation Potential of Bioenergy Plants. Springer, Singapore. https://doi.org/10.1007/978-981-10-3084-0_10
[49] United States Department of Agriculture (USDA), Natural Resources Conservation Service, *Heavy Metal Soil Contamination*, from Soil Quality – Urban Technical Note n.3, 2000

loose soil for the next crop, improving its structure and fertility and clearing it relatively early. Moreover, it can absorb heavy rains thanks to the characteristics of its roots system, and it does not require high use of synthetic chemical inputs (fertilizers, plant protection products and herbicides), preventing the pollution of soils and aquifers, and limiting irrigation water. These characteristics, make it is also possible to consider hemp as an interesting cultivation for the development of biodiversity, even protecting some predatory species of soil parasites. To sum up, cultivation processes of hemp lend to an increase in its environmental, social and economic sustainability.[50]

However, to make a complete picture, it is necessary to mention the two methods of cultivation practised with this plant: outdoor and indoor. By outdoor cultivation, we mean those classic open-air field crops. This type unquestionably requires large open spaces to guarantee the plant a growth as naturally as possible. It leads producers to rely on experts in the sector to identify those soils with the necessary characteristics and the most favourable conditions for the development and growth of plants. Outdoor cultivation is the simplest and "cheapest" solution for large-scale production. But at the same time, it is often less profitable and riskier. Among the advantages of this technique, we find the simplicity for the plant to grow, and the economical savings economy due to the sole need to purchase the seeds and irrigate with an abundantly quantity of water. The disadvantages, on the other hand, foresee an uncertainty of the harvest due to atmospheric agents, moulds and parasites, pollination, possible damage; the need to use expensive specific equipment; the use of a lot of manpower; only one harvest per year, due to cultivation that follows normal light cycles; and the need for large volumes covered for the steps following the collection of the product. It is to remark that the cultivation of hemp in the open field is the most suitable solution for the production of plants not intended for pharmaceutical uses. It has better employment in green building, food, and production of paper or fabrics, which therefore require lower quality.

The other method of growing cannabis is indoors. In this case, there are different techniques from the traditional one to the hydroponic or aeroponic system. Indoor cultivation is an approach designed to obtain high-quality products, avoiding problems that can be encountered when cultivating on the ground where the plants are grown in

[50] Viganò E., ibid.

pots or tanks filled with adequately mixed substrate. The main advantage of indoors lies in the total management of the environment in which plants are grown: lighting, temperature, water, humidity, CO_2 levels, pests and diseases that can arise. The control of these variables means being able to command the growth of plants to one's advantage, and to arrive at cyclic cultivation with a high frequency of harvest. Furthermore, the spaces required are much smaller than those for outdoor growing, and the quality is much higher, making it suitable for medicinal uses, which are also clearly more profitable. On the other hand, even this type of cultivation has some significant disadvantages. The start-up, management and growth costs are much higher. Above of all due to a considerable use of electrical energy necessary for the lamps, aspirators, and filters, but also a greater need for cultivation care and maintenance of the area and the plants. Given the high-quality product obtained, the attention of all steps in production must be higher than in the outdoor cultivation, and the margins of error must be narrower.[51]

So, as we have just seen, the cultivation techniques of hemp are many, and each one has its own advantages and disadvantages. We also found that indoor cultivation would be more suitable to produce of hemp for therapeutic purposes, and that this presents some environmental obstacles. However, it is possible to intervene and try to limit the negative aspects. One example is designing greenhouses capable of reducing energy consumption by optimally using natural light and heat provided by the sun. It would be possible through floors that store thermic energy and the installation of curtains that allow you to keep the place cool without air conditioning or ventilation systems. In addition, collecting rainwater from the roofs of the structures[52]; or using an Integrated Pest Management (IPM) approach on the farm, which means using some information in combination with available pest control methods, to manage damages by the most economical means, and with the least possible hazard to people, property, and the environment.[53] Lastly, the aspect linked to the protection of biodiversity should be mentioned. In fact, it is naturally lost with indoor cultivation but can be recovered

[51] INDOOR/OUTDOOR - Consorzio Canapa Italia
[52] Is cannabis good for the planet? The environmental benefits of cannabis | Ora Pharm
[53] Integrated Pest Management (IPM) Principles | US EPA

through the installation in adjacent areas of woods and forests with great attraction for animals and insects.[54]

Everything I mentioned would require considerable investment costs. What is certain is that the medical cannabis sector, and hemp in general, is continuously growing in Italy and worldwide. We cannot ignore any longer the existence of more sustainable alternatives and, on the contrary, they should be further investigated and encouraged to be applied, especially considering the period of climate crisis in which we find ourselves.

2.3. Focus on legislation for the cultivation and use of medicinal hemp

We have seen a history of cannabis propagated globally, conditioned by cultural and scientific exchanges, making it known and studied more and more for all its features. From this section on, I will start levelling the information that will move the focal point to a small area located in the northern-eastern part of Italy, Rovigo. In the succeeding chapters, I will deepen legislative and economic aspects that want to introduce what will be the knowledge of this one province only concerning the cultivation of therapeutical cannabis. I will start from a broader perspective that will help to contextualize further observations concerning the laws that regulate this agriculture and transformation industry.

2.3.1. History of national laws system

Italy used hemp for millennia and described it as the queen of fibre plants. People treated it to make clothes and to build fishermen nets because of its resistance to salt water, especially in the Veneto region. In the 20s, many famous textile industries that occupied a significant role in the Italian economy produced raw and bleached hemp yarns for weaving, carpets, sails, sewing soles and fishing, tents, supplies for the navy, army, railways, post offices, tobacconists, hospitals. At the time, the Maritime Republics was the body to which cultivation of textile hemp was predominantly linked. In the course of the centuries of European maritime conquests, the demand for cuttings and ropes created a real business around the plant.[55]

[54] Is cannabis good for the planet? The environmental benefits of cannabis | Ora Pharm
[55] https://canape.bio/storia-della-cannabis-in-italia-storie-delle-indistrie-di-canapa/

But, in 1923, there was the first Italian legislative intervention on drugs: the Law n. 396/1923 concerning "*Provisions for the repression of the illegal trade in poisonous substances with narcotic action*". It punished the sale, administration and possession of these substances by unauthorized persons with short prison sentences, a fine and the participation in "conferences in dens" for the use of drugs.[56] In the 30s, the fascist regime declared hashish a recreational derivative, the enemy of the race, as “the drug of the blacks”. Although the cultivation of hemp was studied in agricultural schools with lots of manuals, the regime’s definition led to falsifications and mystifications that, until today, exist regarding this plant.[57]

During the Second World War, however, Middle European and Mediterranean production increased rapidly as textile fibres and Sativa oils became more expensive. In addition, there was a need for raw materials containing a lot of cellulose from which they could obtain explosives by producing nitrocellulose.[58] Between the 40s and 50s, Law n. 1041/1954 "*Discipline of the production of trade and use of drugs*" brought relevant innovations. It provided for tightening criminal penalties for anyone holding drugs without distinction between trade and personal use.[59] At that time in Italy, there were around 100,000 hectares planted with hemp, placing our country in second place in the world, after the crops of the Soviet Union. But after that, two main reasons caused a decline in hemp cultivation. As we already mentioned, international campaigns against drugs dented its reputation. Prohibition spread to Europe, arriving from the United States, where the Marihuana Tax Act was passed in 1937. Moreover, in the years of industrialization and economic recovery, leading phenomena of the Italian historical phase known as the "economic boom", new synthetic fibres were introduced on the market, such as nylon, polyester and other petrol derivatives. The new materials were not imposed too gradually in the production chains, resulting in an abandonment of hemp because of more strenuous techniques and higher cost of production and manufacturing. Even though law was only against the use of drugs, a normative confusion brought to the complete neglect of the cultivation of this plant.

[56] LEGGE 18 febbraio 1923, n. 396 - Normattiva
[57] Catania M., *Il futuro è verde canapa*, Diarkos editore, Varese, 2019, p.
[58] Breve storia della Cannabis in Italia - Canapè - Emporio della Canapa (canape.bio)
[59] Biografia degli interventi legislativi italiani in materia di stupefacenti - DolceVita (dolcevitaonline.it)

In 1961, Italy, together with 183 countries, signed the "*Single Convention on Narcotic Substances*" (updated in 1971 and 1988). It was an international treaty approved by the UN that controlled activities of specific narcotic drugs and established a system of regulations for their medical and scientific use. Opium and cocaine were already part of the treaty, and it was updated to add also cannabis. The signatory countries gradually adapted their legislation to this text classifying the drugs according to tables equivalent to the conventions, thus allowing an internationalist coherence in terms of the norm of drugs.[60] In the preamble of the text, reference is made to the gravity of the phenomenon of drug addiction. And it is by leveraging the consumption of unwanted substances that it communicates that the main objective is actually fighting cultivation and production.

Yet in Italy, the "Cossiga law" (Law n. 685 of 22 December 1975, "*Discipline of narcotic drugs and psychotropic substances*") forbade the consumption and cultivation of hemp, putting the word "end" to this first part of hemp cultivation history. Even though it specified that hemp could be used for scientific research and experimentation, it almost disappeared from the national territory.[61]

The Law "Iervolino-Vassalli" in 1990, D.P.R. (*Decreto del Presidente della Repubblica* - Decree of the President of the Republic) 309/90, known as the "*Consolidated Law on Narcotic Drugs*" was promulgated to regulate substances with doping power.[62] Still in force today, it has undergone, over the years, several changes, of which the most important ones all date back to the early nineties. The first was a sentence from the Constitutional Court in 1991, which stated that it was not enough to have a quantity of drugs just above the "average daily dose" to trigger drug dealing. The second, on the other hand, was an abrogative referendum voted in April 1993, when it abolished the prison penalty for the personal use of drugs. The latest amendment, of February 2006, was the law known as "Fini-Giovanardi", which regulated the use of drugs in Italy. The sense of this regulation was very restrictive regarding the production, possession and consumption of psychoactive substances and equated hard and soft drugs. Cannabis was in the second grouping, which meant they compared it to hard drugs.[63] In the text in force until 2006, the use of cannabinoid-based drugs was allowed. However, since the

[60] Single Convention on Narcotic Drugs (unodc.org)
[61] Storia della Canapa: quando l'Italia era al vertice della coltivazione (enecta.it)
[62] Storia della legalizzazione della cannabis: come si è evoluta la normativa italiana (greenplanetnews.it)
[63] XVII Legislatura - (camera.it)

cultivation of hemp and the manufacturing of medicinal products derived from it were prohibited in the national territory to create masterful cannabis-based preparations, they had to import plants into Italy. The products were marketed by the Office of Medicinal Cannabis of the Dutch Ministry of Health, Welfare and Sport, according to the import procedure provided by the Ministerial Decree of 11 February 1997, precisely about the import of medicines registered abroad. Subsequently, the approval of Law n. 49/2006 classified cannabis and its derivatives as substances of abuse "without therapeutic utility" and included in Table I, with the consequence that the importation of cannabinoid drugs was also prohibited.[64] To allow the numerous patients to continue using cannabinoids, it was necessary for the Minister of Health to sign an ordinance (Minister of Health Ordinance of 18 July 2006) that continued to authorize imports from abroad.[65] Another update of D.P.R. 309/90, after the appeal of researchers and doctors in support of the therapeutic use of cannabis, the Ministerial Decree of 18 April 2007 recognized the therapeutic efficacy of THC, the main active ingredient in cannabis. THC-based and homologous therapies were recognized exclusively in synthetic form.[66] In the updated 2009 version of Table II, section B, Dronabinol and Nabilone were also admitted to importing. Subsequently, the Ministerial Decree n. 33 of 23 January 2013 has inserted in Table II, medicinal products of plant origin based on cannabis (herbal substances and preparations, including extracts and tinctures). Thus, currently, it includes herbal medicines based on cannabis among those that can be prescribed with a non-repeatable prescription, subject to specific prescriptions indicated in the AIFA.[67]

Afterwards, a Ministerial Decree of 9 November 2015, "*Functions of State Body for Cannabis*", provided for by Articles 23 and 28 of the Single Convention on Narcotic Drugs of 1961, as amended in 1972, regulated the procedures for the national production of therapeutic cannabis. In particular, those processes relating to the prescription, preparation, dispensing, and monitoring of magisterial mixtures. Then, again the estimates on production and controls on crops, the appropriateness of the prescriptions, the type of pathologies for which the use of products derived from cannabis is allowed, the plant surveillance system and production costs. With the entry into force of the pronouncement, the Central Narcotics Office of the General Directorate

[64] G602009_1 1..112 (gazzettaufficiale.it)
[65] Trova Norme & Concorsi - Normativa Sanitaria (salute.gov.it)
[66] Gazzetta Ufficiale, Ministerial Decree 18 April 2007
[67] Gazzetta Ufficiale, Ministerial Decree n. 33, 23 January 2013

of Medical Devices and the Pharmaceutical Service of the Ministry of Health also perform the functions of a state body for cannabis. Any qualified doctor registered at the Order of Doctors can prescribe cannabis for medical use through a non-repeatable master's prescription (RNR – *Ricetta Non Ripetibile*), drawn up following Article 5 of Law Decree 23/1998. This must be then kept in the pharmacy for two years from the last registration on the drug register. As with any therapeutic choice, doctors must share with the patients the decision to prescribe cannabis medicines. The pharmacist must give the patient a copy of the prescription stamped and signed at the time of dispensing to demonstrate the lawfulness of possession of the products. This Ministerial Decree makes also possible a reimbursement, subject to the indications issued by the regions and autonomous provinces.[68]

During the parliamentary examination of the bill for the conversion of decree Law 36/2014, the Government accepted an Agenda that invited the Government itself to introduce legislative initiatives. They aimed at allowing the cultivation of cannabis for therapeutic use, taking into consideration the most immediate possibility of allowing the Military Pharmaceutical Chemical Plant of Florence (SCFM) to produce cannabinoid medicines for Italian patients.[69] Additionally, since 18 September 2014, the Minister of Health and the Minister of Defence publicly presented and signed the Collaboration Agreement to launch a pilot project for the national production of plant origin based on cannabis substances and preparations. The objective was and is to guarantee the uniformity and safety to use masterful preparations of cannabis-based substances of plant origin and to avoid unauthorized, counterfeit or illegal products. Point 2 of the Agreement specifies that the pilot project within the SCFM must follow the procedures defined by an operational protocol produced by a specific working group. This Working Group elaborated a summary document for the realization of the pilot project together with a technical annexe for the definition of the national production methods of substances and preparations originated from cannabis.[70] This is the Cannabis FM2 (containing THC 5% - 8% and CBD 7.5% - 12%), the first cannabis-based active substance in compliance with the European directives on medicines on the production process. The methods are deposited and controlled in a pharmaceutical laboratory

[68] Gazzetta Ufficiale, Ministerial Decree 9 November 2015
[69] Gazzetta Ufficiale
[70] Utilizzo dei farmaci cannabinoidi nell'ambito dei servizi sanitari regionali (camera.it)

authorized by AIFA, and the distribution is authorized by the state body for cannabis at the Ministry of Health.

Since July 2018, the FM1 cannabis variety is also available (containing THC 13.0-20.0%; CBD <1%).[71] The Ministerial Decree of 9 November 2015 specified the functions that the Ministry of Health carries out in matters of plant cultivation authorization and determination of the manufacturing quotas of the substance, as well as determining the requirements and guarantees to which this authorization is subject. Furthermore, the decree contains another technical annexe that exclusively reports the uses of cannabis for medical aims, to allow its homogeneous regulation throughout the national territory. Finally, it should be noted that, for the moment, only one medicinal product based on cannabis Sativa extracts authorized for marketing is available on the national territory, applied in symptom-relief treatment in adult patients. The requisites are a moderate or severe spasticity, a negative result from other antispasmodic medicinal products, and the proof of a clinically significant improvement during an initial period of therapy.[72] 25th June 2018 the Ministerial Decree updated the list of medicines referred to in Annex III-bis of the Presidential Decree of 9 October 1990, n. 309, including cannabis-based herbal medicines.[73]

In July 2021, the authorization procedure to extract active ingredients and to produce cannabis extracts was published by the Ministry of Health, referring to Presidential Decree 309 of 1990. The Central Narcotics Office permitted farms cultivating hemp plants from certified seeds of varieties permitted by Community Legislation, to transfer the starting plant material, like cannabis leaves and inflorescences, exclusively to workshops authorized to manufacture extracts containing cannabidiol for use in the production of medicines.[74] The farm requesting the allowance for cultivation must necessarily agree to the conferment of the starting plant material (leaves and inflorescences) with a pharmaceutical workshop authorized by AIFA to generate a pharmaceutically active ingredient. It will be able to transfer the plant material exclusively to the identified pharmaceutical workshop and, on the other hand, the

[71] https://www.salute.gov.it/portale/medicinaliStupefacenti/dettaglioContenutiMedicinaliStupefacenti.jsp?lingua=italiano&id=4587&area=sostanzeStupefacenti&menu=organismo
[72] Utilizzo dei farmaci cannabinoidi nell'ambito dei servizi sanitari regionali (camera.it)
[73] Uso medico della cannabis (salute.gov.it)
[74] https://www.cannabisterapeutica.info/2021/05/26/il-ministero-della-salute-ha-pubblicato-le-linee-guida-per-estrazione-di-principi-attivi/

pharmaceutical workshop will obtain supplies exclusively from the farm that has grown the quantity specified in the transfer agreement in question. The request can come from farms that meet the requirements listed in the Authorization Request Form.[75] At the same time, the list of potentially suitable pharmaceutical workshops was released so that the agricultural companies concerned get in touch to start the complex authorization process at the Ministry of Health that, to date, has been successfully concluded only by two companies.[76]

On the other hand, the Decree concerning the Fund for the protection and relaunch of the beekeeping, brewing, hemp, and nuts supply chains, issued by the Ministry of Agriculture, Food and Forestry, is of December 2021. It defines the criteria and methods for allocating resources of a fund to pursuit the protection, relaunch, development, and investment of the aforementioned supply chains. In particular: criteria for granting individual assistance to beneficiaries, the procedure for admitting the aid, and the verification criteria and the methods for ensuring compliance with the maximum aid limit. The total resources of the fund allocated to the hemp and hemp supply chain amount to 1 million euros for 2021. The stakeholders of the hemp chain are granted support up to a maximum of 300 euros for each hectare cultivated with cannabis Sativa in compliance with the law. of 2 December 2016 and within the limit of 50 hectares for 2021. The fundamental requirement to access the contribution is to sign a contract of at least three years, within the deadline of the application for assistance, directly or through cooperatives with processing and marketing companies. They had to submit the specific application within 30 days from the entry into force of the Decree.[77]

On April 4th, 2022, the Ministry of Defence published a call for private companies wishing to grow medical cannabis on its website, and which lasted until June 27th. The description is as follows: "*Expression of interest in participating in the qualitative selection of economic operators to be invited to the restricted procedure according to art. 61 of Legislative Decree 50/2016 for the award of the cannabis plant cultivation service to be given to the Military Pharmaceutical Chemical Plant of Florence for the manufacture of medicines and pharmaceutical raw materials in GMP (Good*

[75] https://www.salute.gov.it/portale/moduliServizi/dettaglioSchedaModuliServizi.jsp?lingua=italiano&label=servizionline&idMat=STP&idAmb=FBR&idSrv=S15&flag=P

[76] https://www.cannabisterapeutica.info/

[77] Gazzetta n. 38 del 15 febbraio 2022 - MINISTERO DELLE POLITICHE AGRICOLE ALIMENTARI E FORESTALI

Manufacturing Practice)".[78] From the wording, it is evident that the cultivated cannabis will subsequently be supplied to the SCFM for afterwards processing and distribution. Furthermore, once the companies have been chosen, the procedure will still be very long. Between the supply of genetics, cultivation tests, standardization, and resolution of any problems, it will take at least a couple of years for new inflorescences produced to come to patients.

Thus, while on the one hand, we cannot neglect the extensive step forward that this announcement represents for the entire Italian system of medical cannabis, on the other hand, we cannot avoid highlighting various issues which it comes with. The announcement presents several objective difficulties that prevented many from participating. First of all, the operator wishing to participate in the expression of interest was required to already possess an area for indoor cultivation and the necessary staff to carry out all the operations. In addition, in times of energy crisis, announcing that the green transition objectives risk being postponed, the choice to use sodium lamps for cultivation risks being highly counterproductive. LED technology would conversely allow biggest savings and lower electricity consumption. Then, it is necessary to "possess the quality system certification under the UNI EN ISO 9001 series standards (or equivalent certificates issued by bodies established in other Member States will be recognized". Finally, the State requested a production capacity of 500 kg per year, but should remember that, in almost 6 years of production, SCFM in Florence has stopped at a quantity that varies between 100 and 150 kg per year. In Germany, for example, when the tenders for production were published, companies were given 2 years to be able to organize themselves. In the Italian case there is a risk that there were very few realities with the characteristics suitable to participate.[79]

To sum up, we can say that the Italian legislation regarding the cultivation, sale, and use of therapeutic hemp has changed very slowly over the years. In less than a century, the law went from the repression of this substance, considered a drug, to a law that seeks to encourage its cultivation, even if destined to different uses. However, law is very complicated to decipher and, as we saw in the last part, often leave a too narrow margin

[78] Manifestazione interesse selezione operatori economici da invitare a procedura ristretta per affidamento del servizio di coltivazione di piante di cannabis da conferire a Stachifarmiles(FI) per fabbricazione medicinali e materie prime farmaceutiche in GMP - Difesa.it

[79] Cannabis e produzione per i privati: il ministero pubblica il bando, con diversi problemi - Cannabis Terapeutica Cannabis Terapeutica

with the consequence of discourage farmers and entrepreneurs. Intervening at the legislative level could be a need to give a voice to local realities, convincing them to put pressure on them to obtain greater freedom. On the other hand, as we will see in the following paragraphs, the use of medicinal cannabis is increasingly widespread. There are already many states that have made its use legal and above all have organized themselves to ensure that this type of industry develops in a sustainable and reasoned way. Before getting to this part, I will dwell a little more on the legislative characteristics at the level of the Veneto region, to understand its history and at what point we are in the present.

2.3.2. Focus on Veneto region legislation

In this paragraph, I will delve into regional legislation to get a broader view of the legislative situation of therapeutical cannabis. In particular, I will present some supplementary laws from which we will extrapolate crucial information for this study.

In Veneto, the regional council approved on 28 September 2012, law n. 38: "*Provisions relating to the dispensing of medicinal products and magisterial galenic preparations based on cannabinoids for therapeutic purposes*". The provision provides that cannabinoid medicines can be prescribed, at the expense of the Health Service, by the specialist doctor of the SSR (*Servizio Sanitario Regionale* - Regional Health Service) and by the general practitioner of the SSR, based on a therapeutic plan lasting up to 6 months drawn up by the specialist doctor. For the prescription, the doctor must evaluate the patient's eligibility, inform the patient and collect the signed consent. The specialist doctor has to make the first prescription, then also general practitioners can issue it. Free of charge is only in the cases provided for by national legislation, assured that conventional therapies have not worked, and only in the case of oral and inhalation therapy. To obtain it, the patient must be a resident of Veneto.[80]

After that, the Deliberation of the Regional Council n. 1428 of 15 September 2016, concerned, in implementation of the provisions introduced by the decree of the Minister of Health on 9 November 2015, the updating of the regulations relating to the provision by the Regional Health Service of medicines and magisterial galenic preparations based

[80] Cannabis terapeutica in Italia regione per regione - Cannabis Terapeutica Cannabis Terapeutica

on cannabinoids for therapeutic purposes in favour of patients with severe spasticity from spinal cord injury who have not responded to recommended therapies.[81]

Subsequently, the decree-law of 16 October 2017, n. 148 "*Urgent provisions in financial matters and for non-deferrable demanding*"[82], converted with amendments by the law of 4 December 2017, n. 172, established that "the cannabis-based magisterial preparations prescribed by the doctor for pain therapy [...] as well as for the other uses provided for in the technical annexe to the decree of 9 November 2015, are borne by of the National Health Service, within the limits of the level of financing of the standard national health needs to which the state contributes. The doctor may also prescribe the aforementioned magisterial preparations for other uses [...]."[83]

With the regional bulletin n. 65 of 18 June 2018, the regulations relating to the provision by the Regional Health Service of medicines and magisterial galenic preparations based on cannabinoids for therapeutic purposes are updated. Practically speaking, this document presents a small summary of the latest rules on the production and administration of therapeutic hemp. For example, there is a list of all the updated diseases for which patients can obtain a prescription for the administration of cannabis in the Veneto region. Furthermore, given the shortage of the product, it is possible to prepare and supply cannabis-based galenic preparations for reimbursable indications, as well as to Healthcare Companies in direct distribution, also by pharmacies open to the public, in compliance with the GPR in force. A prescription to be paid by the national health service, that has to be renewed from time to time, must cover a maximum of one month of therapy and the control of these therapeutic plans must be carried out by the Pharmaceutical Services of the ULSS (*Azienda Unità Sanitaria Locale Socio Sanitaria* - Local Healthcare Unit Company). Lastly, any previous regional provision concerning medicinal specialities containing cannabis is considered to be superseded.[84]

[81] DELIBERAZIONE DELLA GIUNTA REGIONALE n. 1428 del 15 settembre 2016, source: Dettaglio Deliberazione della Giunta Regionale - Bollettino Ufficiale della Regione del Veneto
[82] Decreto Legge 16 Ottobre 2017, n. 148, source: Gazzetta Ufficiale
[83] Legge 4 Dicembre 2017, n. 172, source: Gazzetta Ufficiale
[84] Bollettino Ufficiale Regionale (BUR) n. 65, 18 June 2018, source: Dettaglio Deliberazione della Giunta Regionale - Bollettino Ufficiale della Regione del Veneto

Another interesting legislative intervention is that of Bur n. 52, of 20 April 2021 concerning the approval of the project and experimentation "*CanVen: optimization of the seed production of hemp in the Veneto area*" and the scheme of a collaboration agreement with the Department of Agronomy, Animals, Food, Natural Resources and Environment of the University of Padua, the Venetian Agency for innovation in the primary sector "Veneto Agriculture" and the Council for research in agriculture and the analysis of the agricultural economy (CREA). "The cultivation of hemp in the Veneto area can represent an excellent opportunity thanks to its versatility and potential to position itself on innovative markets, finding a broad spectrum of uses, and therefore, of economic destinations. In recent years, farmers are giving more attention to the cultivation of industrial hemp in the Veneto Region, especially for fibre and seed production. Even within a framework of relevant interest, numerous problems are limiting its wider diffusion and the creation of a complete local supply chain. In particular, some critical issues related to agronomic and mechanization nature, determined the lack of homogeneity of basic seed production. The phases of fertilization and the subsequent filling of the seed are two of the problems that most plague this crop is. The main conditioning factors are the scarce availability of water and nitrogen in the most critical stages of seed development. Another relevant aspect concerns the organization and management of the phases and sites of mechanical seed collection, which are more complex compared to those for the production of fibre. Some actions were developed in 2021, with the resources made available by Regional Law n. 41/2020 "Budget 2021-2023". They aimed at verifying a regional-level optimization of hemp seed production through the following actions: evaluation of the effect of soil salinity on seed yield; definition of the relationship between nitrogen fertility and hemp seed yield; identification of fertilization protocols nitrogenous; identification of the most promising varieties in terms of seed yield under different conditions; and evaluation of harvesting protocols and subsequent processing to produce seeds with a lower THC content to the legislation. This research activity will see the collaboration of three Bodies that possess, in a complementary way, the technical and scientific skills related to the areas subject to research and experimentation. The regional administration also participates in the project. It provides the skills and professionalism of the staff of Agri-food Management for the implementation of the actions necessary to achieve the results, through the

institutional coordination of activities, and participation in communication and dissemination of results.[85]

Doubts and uncertainties regarding the topic of medical cannabis are still widespread. The regional law of Veneto has tried, in some way, to intervene by financing projects that want to highlight this much-debated issue. What is very much needed is to diffuse the notions concerning cannabis within society to cancel the label of pure "drug" that has been attached to it. After this step, it is crucial to change the legislation, which represents the biggest obstacle to overcome. Only once these two goals are achieved, it is possible to speak about investment to entrepreneurs. Investments require research and initiative. A supply chain such as that of medicinal hemp needs as much manpower as specific machinery, which in turn would be able to lead to the creation of many jobs and a great deal of capital. Later, we will see the legislation of other countries of the world, regarding the production and administration of therapeutic hemp. This will help us understanding why it is necessary to invest in the cannabis production chain and what the results could be.

[85] Bollettino Ufficiale Regionale n. 52 of 20 April 2021, source: Filiera Seminativi e Colture Industriali - Regione del Veneto

3. The province of Rovigo

In this third chapter, the main topic is the economic model of the province of Rovigo. I will delineate some of the most significant macroeconomic aspects, proposing comparisons of data both in different years in the same province and in the same years in different provinces. The analysis of these information will help in understanding the demographical, economical and social situation that Rovigo is experiencing.

3.1. Geo-morphological aspects

The province of Rovigo is in the south of Veneto region, north-east Italy. Rovigo is one of the seven regional provinces, and it is the second least inhabited, after Belluno.[86] Its territory, extremely flat, covers a total area of approximately 1,800 km^2 , and develops mainly along the east-west route, presenting a length of about 110 km, while the width (north-south direction) is less than 20 km. It borders to the north with the provinces of Verona, Padua and Venice, to the west with Mantua and to the south with Ferrara. The area is also known as “Polesine”. The territory, characterized by the presence of a dense network of reclamation canals, is crossed by the two main Italian rivers, the Adige and the Po, which constitute the borders respectively north and south of the province. The province is then crossed longitudinally in the central part by the Tartarian-Canalbianco-Po di Levante shaft, which currently represents a relevant waterway. The eastern part of the provincial territory hosts an environment of rare importance of landscape and natural value, that is the *Po Delta*. It is characterized by pine forests, fishing valleys, and lagoons, which represent unique habitats for many animal species and plants. With over 180 km^2 of valley and lagoon surface, it constitutes the most important Italian wetland. The soil is very fertile and particularly suitable for the cultivation of corn and quality horticultural products. Polesine, for almost its total extension, is today a plain occupied by agriculture and urban agglomerations. Natural environments are, therefore, limited and must be sought almost exclusively in the extreme portion of the Po Delta. The coasts, which generally coincide with the "*scanni*"[87] at the mouths of the branches of the Po, are the most intact areas since they remain undisturbed for most of the year. Here, they host the first forms of vegetation which, going from the shoreline towards

[86] Demo-Geodemo. - Mappe, Popolazione, Statistiche Demografiche dell'ISTAT

[87] Islands or peninsulas, from a few dozen to a few hundred meters wide and sometimes long kilometres formed by the sand brought into the sea by the rivers and modelled by the wind and the waves. They protect the lagoons from the power of the sea, allowing their survival.

the interior, evolve into increasingly complex communities. However, the data collected in recent years show that there is a change in the floristic arrangement determined by the disappearance or reduction of highly natural biotopes.[88] Climate change is definitely one of the causes of the changing environment and habits. In this area, its consequences could bring a notable alteration also in the economy of the territory, which already passed through adaptation in the past years.

3.2. Demographical analysis

As we have just seen, the province of Rovigo is made up of 50 municipalities. Overall, the population at the 2022 census amounted to 229,097 inhabitants, 48.9% of males and 51.5 females, with a density of 125,89 inhabitants/km².[89] The municipality with the largest population is Rovigo itself, which, with its 50,379 inhabitants, is the only municipality to exceed 50 thousand.[90] By analysing the provincial demographic history, we can highlight the demographic decline of the last 20 years. If in 2001 the population was around 242 thousand and in continuous growth, until the highest value in 2010 with around 246 thousand people, after the crisis of 2011 there has been a continuous decrease, with a particular negative trend in that year. From 2013 to today, there has been no more growth in population, rather the opposite.

However, it should be mentioned that this negative trend has been characteristic not only of this province but also of the entire Veneto Region and Italy as well. This is due to a general decrease in the birth rate and part of immigration to other cities or countries. In Italy, there has been a positive variation between 2002 and 2010, from 57 million to 60.5 million, with a decline for the 2011 crisis, down to 59.5 million. Then we saw a quick recovery for the following two years, when the population almost arrived at 61 million and then once again a continuous fall until today, with 59 million people.[91] Lets see what are the factors that influence demographic characteristics.

[88] Piano Faunistico Venatorio – Provincia di Rovigo, 2016. Source: PFV - 17ott16 - parte A.pdf (regione.veneto.it)
[89] Provincia di Rovigo (RO) - Guida ai comuni e info utili (tuttitalia.it)
[90] Comune di Rovigo (RO) - CAP e Informazioni utili (tuttitalia.it)
[91] Popolazione Italia (2001-2020) Grafici su dati ISTAT (tuttitalia.it)

3.2.1. Birth rate

The birth rate[92] contributes to verify the state of development of a population. It is different from the territory to the territory, because it is influenced by the economic development, the degree of modernization of the territory, and the political, social, structural and cultural factors. If we analyse the birth rate in the province of Rovigo, we passed from continuous growth, from 6.8 in 2002 to 7.8 in 2012; until falling in a fairly linear way to 5.1 in 2021. Now, it is the province in the Veneto region with the lowest birth rate. Nevertheless, this trend is true throughout the Italian state, which has gone from a birth rate of 9.4 in 2002, to 9.0 in 2012 and finally 6.8 in 2020.[93] Among the causes of the decline in the first children is the prolonged stay of young people in the family of origin, in turn, due to multiple factors. The time of studying has increased, and young people encounter difficulties entering the world of work. The widespread instability of the work, because of precarious contracts, resulted in difficulties in accessing the housing market. Together they represent a foundation for long-term trend of low economic growth, in addition to other possible factors of a cultural nature.[94]

3.2.2. Old age index and the average age

Strictly related to the birth rate, is the old age index.[95] Another characteristic of the province of Rovigo is the high value of this indicator. It represents the degree of ageing of a population, and it helps to understand if a society can be defined as progressive, static or recessive, depending on the relation between the presence of old and young people. In 2002 there were 194.5 elderly for every 100 young teenagers, 201.7 in 2012 and 250.3 in 2021.[96] Nowadays, therefore, there are more than two elders for every young person. And it's impressive to consider that in 1991, this index was 129.9, so almost half.[97] It is a very high value, and if we compare it to the level of Veneto, it appeared to be 135.2 in 2002, 144.2 in 2012 and 183.3 in 2021.[98] Moreover, the old-age

[92] Birth rate: the average number of births in a year per thousand inhabitants
[93] Indici demografici e Struttura popolazione Italia (tuttitalia.it)
[94] Natalità. Anche nel 2021 prosegue calo nascite in Italia. E anche gli immigrati residenti fanno meno figli. Il rapporto Istat - Quotidiano Sanità (quotidianosanita.it)
[95] Old age index: ratio between the elderly population (65 years and over) and the youth population (0 to 14 years), per 100
[96] Indici demografici e Struttura provincia di Rovigo (RO) (tuttitalia.it)
[97] Provincia di Rovigo (istat.it)
[98] Indici demografici e Struttura popolazione Veneto (tuttitalia.it)

index in Italy in 2002 was 131.4, 148.6 in 2012 and 182.6 in 2021.[99] Currently, the province of Rovigo is the oldest in Veneto and the 14th, out of 105, in the national classification. Thus, it can be also considered one of the oldest Italian provinces.

In confirmation of this fact, it is also worth mentioning the average age, for which Rovigo is in the 15th place in the national ranking. Its average age in 2021 was 48.7, while in Veneto was 46.1, and 45.9 in Italy.[100] The very high average age and old-age index result in an equally high value of the dependency index.[101] The social and economic load of the inactive population was 48,9 in 2002, 53.0 in 2012, and in 2021 it reached 60.1. This characteristic makes the province of Rovigo the second in the region, after Belluno, in terms of non-working age population. Moreover, the structure index of the active population tells us that in 2021 there are 173.4 residents aged 40-64 (compared to 102.9 in 2002) per hundred aged 15-39, making it possible to find the Venetian province with the less dynamic working population in terms of capacity for development and adaptation.[102] A direct consequence in the economic overview of the province is clear, but before deepening those aspects, I will consider more demographic aspects that will help us to delineate the strengths and limits of Rovigo province.

3.2.3. Life expectancy

Italy has been one of the most long-lived countries for years in the international context. Its life expectancy at birth[103] is lower only to that of Japan, that is the first of the classification with 84.2 years, then there are Switzerland and Spain with 83.5.[104] Until 2019, Italy saw a constant increase in life expectancy, which in 1992 was 77.2 years old and had reached 83.2 in 2019, until the outbreak of the global pandemic after which the value decreased. The same happened in Veneto, where, on average, life expectancy is even longer, and it went from 77.5 years in 1992 to 83.8 in 2019. Considering all the provinces of the region, Rovigo is always in last place. In 1992 the index was 76.8 years but in 2019 reached 83.2 years.[105] The results of life expectancy, old age index, and

[99] Indici demografici e Struttura popolazione Italia (tuttitalia.it)
[100] Tuttitalia.it - Guida ai Comuni, alle Province e alle Regioni d'Italia
[101] Dependency index: the social and economic load of the non-active population (0-14 years and 65 years and over) on the active population (15-64 years).
[102] Indici demografici e Struttura provincia di Rovigo (RO) (tuttitalia.it)
[103] Life expectancy at birth: average duration of life starting from a given age (in this case birth)
[104] VENETO SOSTENIBILIE (regione.veneto.it)
[105] Tavole di mortalità: Speranza di vita alla nascita con Italia copie (istat.it)

average age are directly associated with the mortality rate, that is higher here than in the other provinces, as we will see in the next paragraph.

3.2.4. Mortality rate, causes of death and demographic nature balance

The mortality rate[106] emphasises the negative trend of the population. In Rovigo, in 2002, it was 11.3, 12.7 in 2012, and 14.6 in 2020. In Veneto, it was 9.3 in 2002, 9.7 in 2012 and 11.8 in 2020. In Italy, it was 9.8 in 2002, 10.3 in 2012 and 12.5 in 2020[107]. From this evolving phenomenon, it is possible to draw some ideas of reflection on the health state of the population to guide the choices of regional public health. Generally speaking, the total number of deaths of residents in Veneto registered in the archive of the causes of death is increasing, and the causes are changing. About two-thirds of the deaths are attributable to tumours and diseases of the circulatory system. The principal causes of death are represented by diseases of the circulatory system in women and tumours in men, which, however, have seen, respectively, a decrease from 43% to 33.1%, and from 31.4% to 28.9%.[108] It demonstrates that there have been scientific and medical improvements in the health system. Other frequent causes of death, particularly among young people aged 15-29, are accidents and suicides. For this last cause, also old people have a high impact, and, most of the time, are men (on average 75%). However, this estimate is accurate also with Italy, as well as with the rest of the world. Suicide is the third most frequent cause of death among young people.[109]

An additional index related to the birth and mortality rates, is the demographic nature balance, which corresponds precisely to the difference between births and deaths. In Rovigo, this index has been facing a negative trend since 2002, reflecting the lack of dynamism of the territory in favour of an increasingly elderly population.

One interpretation of these data is that large cities are getting bigger, while the suburbs and small municipalities continue to shrink. In general, northern cities have a slightly higher mortality rate, and more considerable influx of immigrants, both from the rest of the country and from abroad. In the south, on the other hand, people tend to have more

[106] Mortality rate: the average number of deaths in one year per thousand inhabitants.
[107] Indici demografici e Struttura provincia di Rovigo (RO) (tuttitalia.it)
[108] SAS Visual Analytics Viewer (regione.veneto.it)
[109] Caratteristiche e andamento temporale della mortalità per suicidio in Italia: uno studio descrittivo sugli ultimi 30 anni (iss.it)

children but also emigrate more frequently from this area in search of better opportunities.

3.2.5. Migratory balance

If we analyse the migratory balance[110] of the province of Rovigo in the last twenty years, it shows ups and downs. The total migration balance in 2002 was +1310, then there were two peaks in 2003 and 2007 with over +2300, and remained around +1500 until 2012. Another high peak in 2013 and then a collapse with a negative trend for the next 4 years, reaching -589 in 2017. In 2020, on the other hand, there was a slight increase of +38, but always following the trend of the last 9 years from which we can see that the number of registered registrars is decreasing.[111]

All the data I have just talked about converge in a shared consideration. The Polesine, in the last 10 years, has lost almost 6% of the population. Whether it was due to the birth rate or the choice of realizing one's future elsewhere, it has seen an increase in the mean age of the population and a lower young workforce, that could bring changes and development in the territory.

3.2.6. Level of education

According to the census carried out by ISTAT in 2020, the distribution of qualifications by province in the Veneto region is homogeneous, with some minor differences. Although illiteracy or the absence of an educational qualification is less common in the region than the national average (3.6% compared to 4.4%), in the province of Rovigo there is the largest share of people without any educational qualification with 4.9%, and we will see that also for the other levels of lower education. For example, 17.3% have only an elementary school degree, and 31.2% a middle school. The regional value is instead 16.3% for the first variable, and 29.1% for the second, while in Italy it is 15.5%, and 29.3%. For qualifications beyond the middle school license, Rovigo has the lowest values among all the provinces. The percentage of people with a secondary school diploma or professional qualification is 35.1%, very close to that of the city of Padua with its 35.9%, while Belluno is first in the ranking with 40.6%, against a regional value

[110] Total migratory balance: difference between the number of members and the number of those deleted from the registers personal data for internal transfer of residence, with abroad or for other reasons.
[111] Popolazione provincia di Rovigo (2001-2020) Grafici dati ISTAT (tuttitalia.it)

of 37.2% and national value of 36%. In the territories that host a university, the lower incidence of basic education is flanked by the more significant higher degrees: Rovigo has the lowest number of people with a tertiary level of education[112], which overall reaches 11.6 %. It is surpassed by the university province par excellence, Padua, which even reaches 16.4%, against the regional average of 14% and the national average of 14.9% of people with a tertiary level of education.[113]

To have a complete picture and understand how these indicators have evolved, we can make a comparison with data from 2011. In that year, the level of illiteracy is not directly comparable to that of 2021, as the reference sample that has been used was the population with the age of 6 years and more, instead of 15 years and more. Thus, more people are considered in 2011. Nevertheless, we can still say that illiteracy was the 1%, and the 8.3% didn't even have any study title. The regional data was around 0.5% for illiteracy, and 7.4% for the total number of people without a study title, and at the national level, it was 1%, and 8.7%. Still, in Rovigo, 23.2% of the population only had the elementary license, while 30.7% also had the middle school license. The same data at the regional level were 21.6% for elementary school and 30.1% for middle school, and 20% with primary license and 29,7% with middle school licence at the national level. The percentage of people in Rovigo with a secondary school diploma or professional qualification was 29.6%, 31,6% in Veneto and 31,2% in Italy. Last, the level of tertiary education was just 7.8% in the province, against the 10.2% of Padua, 9.5% in the region and 10.4% in the nation.[114] If we also compare these data with the other Veneto provinces, we see that, for the higher the grade of education, the lowest percentage belongs to the population of Rovigo. This trend remains permanent after ten years, yet there have been a lot of improvements in all the three levels we just analysed. The position of illiteracy has decreased, and the grade of education has, on the other hand, grown. This means that investments and improvements have been made to ensure an increasing number of people with a high degree of education. Moreover, considering

[112] The "Tertiary and higher" category includes: 1st level tertiary qualifications, which include the ITS Higher Technician Diploma, Degree or I level AFAM academic diploma, the university diploma (2-3 years), the direct school for special purposes, other tertiary diploma not university; II level tertiary qualifications, which include a master's / specialist degree (two-year, single-cycle, 4-6 degree years), the second level academic diploma (including the titles of the old system - single level); the PhD, which includes the academic research training diploma.
[113] Il Censimento permanente della popolazione in Veneto, ISTAT, 2020, source: https://www.istat.it/it/files/2022/03/FOCUS-VENETOdef.pdf
[114] Grado di istruzione dettagliato della popolazione residente di 6 anni e più (istat.it)

that public investments for education in Italy are among the lowest in Europe, the results could be significant.[115] Schooling leads to improving economic growth and employment, forming workers with the necessary skills to establish themselves in the labour market. It can also help prevent poverty and social exclusion, ensure the maintenance of human and civil values, and help to combat all forms of discrimination. In this sense, the territory of Rovigo, while remaining among the most disadvantaged in the region, has been anyway able to make great progress and advancement on different aspects connected to territorial development, and it should aim to make more for a better future.

3.3. Economy

The Polesine is within a strategic area bordering economically relevant regions (Lombardy and Emilia Romagna), in the centre of the beating heart of work, innovation and the economy of Central-Northern Italy. Its strategic location is enhanced and strengthened by an efficient infrastructural system that connects it to the primary national and international economic centres. The territory is also crossed by the river that connects Mantua, Cremona, and Milan. Therefore, its *Interporto*[116] is the only one of its kind in Italy. This infrastructure integrates road, water and rail modes, representing an opportunity for the business system interested in both local and foreign markets. The economy of the province of Rovigo is bound to the peculiarities of the area, marked by a significant presence of agriculture and a widespread manufacturing sector centred on small and very small businesses.

Agriculture is a fundamental component of the provincial economy, representing the 5.7% of the GDP (against a regional average of 2.1%), and is characterized by mixed arable land (corn, wheat, soybean, chard) with a good fruit presence, from intensive horticulture and designated areas to rice cultivation. In the Po Delta area, the primary sector is enriched by fishing activities, *vallicolture*[117] and *lagooncolture*.

In the secondary sector, the importance of craftsmanship is significant (21.7% of the total active locations), which brings together about 6,500 companies out of about 30,000 active localizations registered with the Chamber of Commerce. The prevailing

[115] Percorsi - Regione del Veneto
[116] An equipped centre for the collection and sorting of goods transported by road and rail
[117] Breeding of some species of fish in the brackish waters of the fish farms

manufacturing sectors are packaging clothing, manufacture of metal, and wood and furniture products.

Lastly, services include the tourism sector developed in the Rosolina Mare area and Albarella Island, where the natural and landscape resources of the Po Delta area can encourage a new development model linked to the territory and the environment, marking the quality of life. There are many itineraries for bicycle, horseback, motorboat or canoe, to visit these countless green spaces and admire the colours and atmospheres.[118]

The coming section will examinate macroeconomic features of the province of Rovigo, identifying and explaining the most important indicators, and analysing their trend over the years. The focus will be on the GDP, the level of employment and unemployment, imports and exports.

3.3.1 Gross Domestic Product

GDP represents the central indicator of the level of economic activity. It measures the value of all goods and final services of production, of a country, in a year. GDP accounts only the goods and services of new products produced within a country. Therefore, it does not consider the goods and services produced by citizens abroad but includes the production of foreigners within the country. In addition, studying past and present trends is also essential for making estimates of future evolutions.[119] GDP in Italy, as for any other country, can be measured in three different ways. To calculate its value, it is necessary to analyse the demand (consumption + gross fixed investments + exports - imports); the offer (added value + taxes of all production activities). Alternatively, it can be determined by referring to all income from employee employment added to the gross result of business management. Finally, the GDP can be quantified in nominal terms, in its value expressed in current currency, or at current prices, in real terms, depriving it of the variations of the prices of goods and services in one year to the other, or at constant prices compared to a specific year and, with the

[118] venicexport.com
[119] Il PIL: che cos'è, come si calcola e a cosa serve - Borsa Italiana

same purchasing power, calculating its real purchasing power specifically, and therefore normalizing a comparison between different countries.[120]

After this brief introduction regarding the most relevant information on the gross domestic product, we can now deepen the question by presenting data. Italy witnessed a sustained growth of GDP from 1950 to 2000. Since 2000, the growth of the indicator has been stagnant due to internal systemic factors. Nonetheless, Italy is the 8th world economy in terms of nominal GDP. Between 1980 and 2000, the average growth rate of the indicator was approximately 9.6%, against that of 1.5% recorded between 2000 and 2020. Accurately, in the 90s, it amounted to only 701,352 million euros, in 2000 to 1,304,137 million euros and in 2020 to 1,653,577 million. Within the first twenty years, the value more than duplicated, but later the growth slowed down. The reasons why, recently, Italian GDP has increased less than other European countries are many, and some internal weaknesses are evident. On the one hand, the payment of the enormous public debt accumulated in the past subtracts resources from investments that could create wealth in the future. On the other, there are evident internal critical issues related to the low productivity of many companies, the lacking public investments in research and education, corruption phenomena, a strong weight of evasion and the unused economy. All this generated, and in turn generates, a high unemployment rate, a serious demographic crisis and a poor propensity for the digitization of the country.[121] Nonetheless, nowadays, Veneto Region contributes 9.2% to the national GDP, conquering third place among the Italian regions, with 152 billion euros in 2020, which however saw a 9.7% decrease compared to the previous year, when GDP amounted at 166.4 billion, for reasons related to the global pandemic.[122]

Since it has not been possible to identify the GDP of the Province of Rovigo, it is, in any case, interesting to understand at least what the pro-capita income of the province is, mostly comparing it with others of the same region. From the analysis of the tax return of 2021 reported for the 2020 tax year, Polesine turns out to be the poorest in Veneto. And it is certainly not a surprise because, as we have already seen for other indicators, in almost all the statistics it present disadvantages. The average national

[120] Il PIL italiano - Italia in dati
[121] Il PIL italiano - Italia in dati
[122] Regione Veneto - U.O. Sistema Statistico Regionale - Banche dati economia - Prodotto interno lordo

income is 21,566 euros. In Veneto, the average income is 22,528 euros, and it places itself in the eighth position in the national ranking, led by Lombardy, in front of Emilia, Trentino Alto Adige and Lazio, while at the bottom is placed Calabria.
Each citizen of Rovigo has an average income of 19,407 euros. In Veneto, at the level of provinces, Padua is the province with the highest average taxable (22,594 euros), followed by Vicenza (21,960) and Treviso (21,793), and Verona is fourth (21,514 euros), last, there are Venice (21,072), Belluno (20,796) and Rovigo.[123]

The low income, combined with a low birth rate, a high mortality rate and high average age, make Rovigo find itself in a fairly stable and not dynamic situation. This leads the economy to not increase, and young people consequently prefer to move to other areas, not finding in the territory a possibility of establishing themselves to live.

3.3.2. Exports and imports

Another decisive factor outlining the dynamism and independence of a country is the export and import indices. Exports are activities carried out through the sale on the foreign markets of goods and services produced within the domestic economy. Companies operating abroad are more competitive than those that circumscribe their business only in the internal market. The skills gained in different markets make companies more productive and structured. Imports are instead activities that provide for the purchase by an economic system of goods and services produced within foreign economies. If the values are high, they indicate poor competitiveness of the nation in the sectors of individual goods.

In 2001, exports from the province of Rovigo were worth about 758 million euros, out of a total of about 39.3 billion in the Veneto region, and 272 billion in Italy. In 2011, however, these amounted to 1.3 billion for Rovigo, 50.3 billion for Veneto and 357 billion for Italy. To date, we are at 1.6 billion for Rovigo, 70.2 billion for Veneto and 516.3 billion for Italy.[124] We can see that exports have generally increased during the past 20 years. In 2021, after a year in which the economic data recorded strong fluctuations due to the pandemic emergency and the restrictions imposed at the international level, the companies of the Rovigo area contributed to the formation of

[123] I più poveri del Veneto siamo noi - Rovigo IN Diretta
[124] Regione Veneto - U.O. Sistema Statistico Regionale - Banche dati economia - Commercio con l'estero

2.3% of regional exports. It was the lowest level among the provinces of the Veneto, where Vicenza contributed for 29%, that can be considered the second capital of Northeast exports, only after Milan[125]. The small value of Rovigo is significantly influenced by the collapse of 90% of exports of pharmaceutical products compared to the previous year. In 2020, in contrast with the general trend, it experienced an export boom.[126] The leap of a percentage point in the pandemic year is mainly due to the production of companies such as the Fresenius Kabi Ipsum of Villadose, affiliated with a German multinational.[127] It is one of the leaders in the Sterile Manufacturing of Beta-Lactam Active Pharmaceutical Ingredients (APIs), supplying over 50 different products to more than 70 countries.[128] Still referring to the last year, 15.9% of exports in the province of Rovigo was for machinery and appliances n.a.c., or indifferently designed for industrial use, construction and civil engineering, and for agricultural or domestic use. 14.9% consisted of substances and chemicals, and 5.1% was from pharmaceutical, chemical-medicinal, and botanical items. Among the other relevant values, we find 13% for rubber and plastics, 10.1% for base metals and metal products, and 10% for food products, drinks and tobacco. The latter value has seen a negative trend, as well as other traditional sectors of the Polesine economy, such as the aforementioned pharmaceutical sector and also, for example, the products of non-permanent crops (including hemp, inserted between crops textiles). By analysing the macro geographical areas of destination of products from Rovigo during the year 2021, it is visible that Europe is the main outlet channel, constituting 82.4% of the value of provincial exports. In the first place, we find Germany, followed by France, Spain, and Romania. towards which Rovigo sends machinery of different types. Shifting the attention to other continents, exports to America have collapsed, which now constitute 6.6%, with a decrease of 87% almost exclusively due to the drop in export volumes of the health sector products. Towards Asia, export volumes reach 8.2%, while they are just 2.3% in Africa and 0.5% towards Oceania and other territories.[129]

[125] Export: Vicenza, solo Milano davanti per vendite all'estero - Veneto - ANSA.it
[126] Statistiche Import Export anno 2021 - Venezia e Rovigo, Camera di Commercio Venezia Rovigo, Ufficio Comunicazione Statistica
[127] La pandemia non frena l'export: Rovigo unica provincia in crescita (ilgazzettino.it)
[128] Home - Fresenius Kabi Italy (fresenius-kabi.com)
[129] Statistiche Import Export anno 2021 - Venezia e Rovigo, Camera di Commercio Venezia Rovigo, Ufficio Comunicazione Statistica

Considering imports, in 2001, Rovigo imported for a value of 600 million euros, out of a total of 29 billion in the Veneto and 263 billion in Italy. In 2011 it doubled to 1.2 billion for Rovigo, reached 40.7 billion for Veneto and 401.4 billion for Italy. In 2021, the value of the province almost tripled, up to 3.3 billion, corresponding to the 6.2% of Veneto imports, which has increased to 53.3 billion, and arrived at 466 billion in Italy.[130] The sector with the greatest percentage of imports is that of the extraction of minerals from quarries and mines. It was 59.2%, followed by 8.1% of the agriculture, silviculture and fishing sector, 6.6% of substances and chemicals, 6.2% of food products, drinks and tobacco, 5.5% of computers, electronic and optical devices, 3.2% of base metals and metal products, and all the other sectors are lower than 1%. The principal geographical areas from which Rovigo imports goods are Asia, with 57.7%, 35.7% from Europe, 4.1% from America and just 2.5% from Africa.[131]

It is clear that since 2001, the Italian, regional and provincial imports and exports have grown constantly. The exception was 2020, the year in which there was a decrease in the international commercial interchange due to the Covid-19 pandemic. Moreover, by comparing these data, it is possible to highlight how the import and export balance between 2001-2011 was almost balanced, while in the last years, it was negative of around 2 million euros. It means that the Province of Rovigo depends a lot on imports, and that, for some sectors, it depends on other states. If we analyse the balance of Veneto and Italy, these are positive and indicate that the money that entered with exports was more than those that came out for imports. It can therefore be asserted that, in recent years, exports have been a determining tow to the GDP of Rovigo, Veneto and Italy.[132]

3.3.3. Employment and unemployment

The working age population, people over 15 years old, defines the starting aggregate between unemployment and employment. Part of it constitutes the workforce, defined as the sum of people employed added to people looking for work. The population of age work that does not work and does not seek employment, for example, because occupied in unpaid activities, is, therefore, the non-workforce. The employment rate indicates the

[130] Regione Veneto - U.O. Sistema Statistico Regionale - Banche dati economia - Commercio con l'estero
[131] Statistiche Import Export anno 2021 - Venezia e Rovigo, Camera di Commercio Venezia Rovigo, Ufficio Comunicazione Statistica
[132] Import ed Export italiano - Italia in dati

relationship between employed workers and the population of working age. Unemployment is the percentage relationship between the population older than 15 years old, and is looking for a job and the total workforce. Indicators based on the number of working people are relevant for social considerations. It is essential to know the composition of unemployment to identify groups of people with more insertion problems in the labour market.[133]

In addition to all the indicators mentioned, these two values also demonstrate developmental situation of Rovigo, and we will see how they changed in the past 30 years. According to Istat data, in 1991, the employed were 45.9%, 47.5% in 2001, 48.3% in 2011[134] and 46.3% in 2021. It is not surprising that there has not been a relevant change, particularly considering that the population of non-working age, with which the dependency index is measured, is the second highest in the region. In 2002 it was 46,5, while in 2021, it was 57.7. This ratio expresses the theoretical social and economic load of the population of active age: values above 50% indicate a generational imbalance. Nevertheless, it is significant to remember that the population has decreased, implying a drop in the labour force. Moreover, the regional and national percentages are worth mentioning to have also a broader picture of the situation. If on the one hand, in 2021, the employment rate in Veneto was 50.3%, thanks to the high values of Treviso, Vicenza and Verona, in Italy the percentage was 44.6%, with almost two points of detachment from Rovigo. In some regions employment is even under 40%, like the whole area of the South, which reaches a minimum of 31.9% in Sicily.[135] In these areas, per capita GDP often remains half that of the northern regions, leading young people to emigrate towards other region or states. It is, therefore, important to set up the right methods of comparison to have an exhaustive territorial analysis.

The unemployment rate was 10.4% in 1991, 6.3% in 2001, 7.9% in 2011[136] and 9.4% in 2021. Unemployment in the North West of Italy is 6.6%, 5.4% in the North East, and 8.8% in the centre. This value rises quickly if we move to the South and the Islands, where it reaches 16.7%. Campania is the region with the highest unemployment rate, with 19.7% and, in the city of Naples, it reaches 24%, almost a quarter of the city

[133] Che cosa si intende per occupati, disoccupati e inattivi - Openpolis
[134] Provincia di Rovigo (istat.it)
[135] Tasso di disoccupazione: Dati provinciali (istat.it)
[136] Provincia di Rovigo (istat.it)

population.[137] Therefore, once again, the historical gap that exists between the North and Southern Italy is highlighted. This difference has been subject to development plans for a long time, and had the purpose of making it less evident, but from the data analysed, it still needs progress.

Lastly, the sectors in which the inhabitants of Rovigo mostly work are 60.6% in services, 33% in industry and 6.4% in agriculture. It is interesting to note that even 20 years ago, in 2001, the distribution was almost the same with 61.3% in services, 33.7% in industry and 5% in agriculture.[138] As we have already examined, the cultivation activity has always characterized the territory with its agricultural and livestock products. The industrial sector has a wide range of industries operating in the metalworking, chemical, textile, clothing and wood sectors. The various administrations treated the touristic aspect a lot in recent years in an attempt to reconnect the city to the environmental heritage of the province and the Po Delta Park. Today, it represents a symbol of the territory thanks to its local and international projects aimed at conserving and developing the area.

3.3.4. Local Labour systems

On the last decades, the regional development policies gave more importance to the economic characteristics at the territories level. The structure and performance of the economies of the Regions are the results of regional development factors, which connect to the national and supranational levels, and reflect the dynamics of the territories of the sub-regional level. It became crucial to understand how the dynamics of employment in companies affected regional territory. The consequence was the introduction of the local labour systems (*Sistemi Locali del Lavoro - SLL*). Local systems are functional and interconnected areas identified based on horizontal relationships. The SLLs are an aggregation of two or more common contiguous municipalities, by reason of self-containment of the daily commuting flows between the location of residence and the workplace. Their configuration, unlike the administrative areas, can change over time as a result of the change in commuting flows between cities. This feature makes local systems suitable for the analysis of socioeconomic phenomena, and their evolution over time. Development policies can consider territories

[137] Tasso di disoccupazione: Dati provinciali (istat.it)
[138] Regione Veneto - U.O. Sistema Statistico Regionale - Banche dati società - Lavoro

as economic and social systems where endogenous resources for development originate[139]. It is intriguing to notice that in 2004 in Veneto, there were 51 of them[140], while nowadays, there are 43. This suggests that, in the past 18 years, some SLLs were absorbed into others. The systems had to adapt to the changes in society and economic analysis.
Rovigo province is part of them, and also its number of SLLs has changed over the years. It passed from six in 2004, to only three in 2020: Adria, Rovigo and Badia Polesine.[141]

Looking at the historical series of the SSLs in Rovigo, we also find data of interest concerning, for example, the employment and unemployment rates. In 2011, Adria had a 45.7% employment rate and 6.6% unemployment; in Badia Polesine, employment was 48.6%, and unemployment was 5.3%, while Rovigo had 49.9% employment, and 4.6% unemployment. In 2021, values changed dramatically for all three local labour systems. Employment rose, while unemployment behaved differently. Adria reaches an employment rate of 47.9%, and unemployment of 6.5%, in Badia Polesine employment rose to 51.9%, and unemployment drops to 4.3%, while in Rovigo 50.5% of employed and 5.1% unemployed. These values are dissimilar from the ones reported above about the province rates. Employment is higher, and unemployment is lower when we investigate the SLLs. This, is characteristic of them, considering that they were established based on work. The provincial data do not necessarily represent most correct picture of the economic aspect of society, as there are other factors to consider, like commuting, which changes the socioeconomic results of a territory. In my research, data associated with commuting for work and study reasons are very intriguing. The provincial statistics concerning the local labour system are changing. As for the historical series of the commuting of the province, in 1991, there were almost 9 thousand incoming commuters and 13.6 thousand outgoings in 2001, 10 thousand incoming and 18.7 thousand outgoing, and in 2011 12.4 incomings and 19.7 thousand outgoings. Lastly, for all the three years taken in exam, the internal movements passed

[139] I Sistemi Locali del Lavoro, Conferenza regionale dell'agricoltura e dello sviluppo rurale del Veneto, Regione del Veneto, 2020
[140] stat_flash_4 ottobre.cdr (regione.veneto.it)
[141] I Sistemi Locali del Lavoro, Conferenza regionale dell'agricoltura e dello sviluppo rurale del Veneto, Regione del Veneto, 2020

from 107 to 100.1 to 99.7 thousand[142], and in 2019 increased to 118 thousand[143]. SSLs do not own as much historical information, and there is no documentation that refers to commuters in the local labour systems in Rovigo after 2011. Thus, we can make a comparison with the province data in 2011. That year saw 18.7 thousand incoming commuters and 25.3 thousand outgoings, while the internal movements were about 86.4 thousand.[144]

The incoming and outgoing values are higher in the second case, making it particularly interesting for territorial and transport studies. Veneto region defined a territory "zoning", according to the dimension of internal mobility, not limited to commuting but that also comprehends the localization of didactic, health and touristic districts. In this scenario, there are four diverse regions: the central-eastern metropolitan area, formed by Venice, Mestre, Padua and Treviso, closely related to each other; the central-western metropolitan area, monocentric on Verona that attracts minor and interprovincial flows with less force; the piedmont corridor, which unites Vicenza and Treviso with gravitational effect on the mountain territory above; and finally the minor poles of attraction, such as Belluno and Rovigo, with different characteristics based on the areas of influence.[145]

Additional indices can be calculated by studying the entry and output flows at the municipal level. The first is the index of attractiveness, obtained considering the difference between the non-residents who enter a municipality and those who come out of the it. The attractiveness is higher in the provincial capitals, and in the municipalities of Bassano del Grappa, Castelfranco Veneto, Thiene, and Schio. Instead, in non-attractive areas, a daily migration is observed, and it brings more residents to leave their borders rather than attract workers or students from outside. Most of the municipalities of Rovigo belong to this second category. The second is the commuting index, which considers the relationship between those who work or study in the municipality of residence, and those who exit from it. The high level of commuting characterizes most peripheral areas, the opposite side is for the largest development centres, with higher entry flows in comparison with the outgoing. As we have already seen, Rovigo is not an attractively pole, and the number of commuters is higher in exiting the area. Smaller

[142] Flussi di pendolarismo (istat.it)
[143] Statistiche Istat
[144] Flussi di pendolarismo (istat.it)
[145] Il-consumo-di-mobilità-nel-Veneto_Novembre-2008.pdf (fondazioneleonemoressa.org)

municipalities, in addition to a lower population mass, have less varied economic activities than a larger territory.[146] And, in Rovigo, the economy is predominantly focused on agriculture, fishing, craft, and tourism, not presenting big technological and innovative competitiveness.

As a summary of the information presented, it is clear that the territory of Rovigo has been crossing a socio-economic crisis for many years. It is necessary to act as soon as possible with a joint and unitary action of all political, social and economic forces that can allow the region and national governments to implement the necessary interventions to relaunch the area. The territory has great potential due, for example, to the geographic positioning, the production of alternative energy, the opportunity to develop business networks linked to manufacturing transformation, construction, and agriculture. But still, the urgent need is to esteem at the same time territorial excellence of crafting and realities that are, on the other hand, promoting innovation and new technologies. It should be made with a view of the competition to develop local entrepreneurship.
And to bring back the focus of this thesis, we will see how investments in the therapeutical cannabis industry brought, or are bringing, positive effects to other territories, from which Rovigo could take an example and take advantage of its qualities.

3.4. CREA of Rovigo

Up to now, we have seen the characteristics for which the territory is considered disadvantaged compared to others. However, in Rovigo, as already mentioned at the beginning of this thesis, there is an important research centre: CREA-CI. Speaking on a national level, this research institution, is divided into four offices and two laboratories, which have their historical origins at the beginning of the 1900s. In 1910 the Royal Experimental Station of Beet Growing of Rovigo was established. In 1968, together with the Institute of Vegetable Breeding for Cereal Growing of Bologna became the Experimental Institute for Industrial Crops. Today, the Busa Carrare Experimental Centre in Rovigo covers approximately 70 hectares, including 3 shelters with equipment, a workshop and an iron and glass greenhouse.

[146] Il consumo di mobilità nel Veneto, Fotografia del sistema economico regionale, source: Il-consumo-di-mobilità-nel-Veneto_Novembre-2008.pdf (fondazioneleonemoressa.org)

The agricultural area is intended for the following activities: keeping the breeder pure to control the genetic purity of the varieties registered by CREA following the programs defined with private individuals; area dedicated to the Registry trials, intended to host agronomic trials of sugar beet; an area that extends over an area of about 7 hectares to test, in agreement with private individuals/research projects, on sugar beet, hemp, brassicas; crop rotation to obtain agricultural products (wheat, sugar beet, corn, soy, etc.) to sale.[147]

CREA is studying cannabis since 1995, and is the owner of all the varieties of hemp recorded in Italy, from the selections intended for agro-industrial use to those with a high content of psychotropic substances. Around 2002 the interest in therapeutic hemp, in the example of the Netherlands, was born. However, in those years, obtaining permits to work with psychotropic substances was very complicated. For this reason, they decided to focus on research of other cannabinoids, such as CBD, which was then very profitable as other scholars had focused on the THC molecule. Then when experimenting with THC also became legal, the centre of Rovigo and the SCFM in Florence remained, in Italy, the only places where it is possible to grow hemp plants that exceed the THC limit of 0.2 %. The plants intended for experimentation are kept indoors, sheltered from natural light, to ensure quality of the product. The small hemp seedlings grow in a completely artificial environment made of walled windows, high-voltage lamps, tanks filled with nutrients, fans and dehumidifiers. The plants are grown with a type of hydroponic crop: each has its pot where a nutrient solution rich in mineral salts arrives, distributed through thin black pipes. The temperature is stable, as well the humidity rate, to ensure that they do not go into flowering. When needed, they take root cutting and make them new plants. This method, called cloning, allows one to obtain the same individuals, ensuring the constancy of the product.[148]

The CREA of Rovigo is of extreme relevance at the national level. The State should grant more funding and contributions for the cultivation and transformation of this plant. There needs to be a more serious commitment to science and research. At the same time, it would be essential to focus on disseminating the knowledge and results obtained. There are still many doctors who do not know the properties of medical

[147] Azienda Busa Carrare - Rovigo - Cerealicoltura e Colture Industriali - CREA
[148] Dentro il CREA di Rovigo, dove nasce la cannabis italiana (vice.com)

cannabis in-depth enough, and this helps to keep the demand relatively low. The advancement of an industrial chain of therapeutic cannabis would bring added value to a territory linked to this cultivation from the past. It could be also able to start a business of national and, why not, international relevance.

In the interview chapter, I will show how this research centre has been important for innovative projects regarding hemp. Finally, I will try to outline an industrial project idea that will effectively allow us to see what the advantages and disadvantages of this industry would be.

But before elaborating on this, in the following section, I wanted to present international projects that involved the production and transformation of therapeutic cannabis. The examples are taken from countries on different continents and present different results. This will give a broader perspective of what the province of Rovigo could encounter if it would invest in such a business.

4. International projects for the cultivation of therapeutic hemp

The growth of the cannabis industry is massive and accelerating around the world. Whether it is a recreational weed, medicinal cannabis, or industrial hemp, people are starting to understand the importance of investing money in the hemp industry. And the good news is that there are tons of opportunities to find a career in the cannabis industry. Across the world, innovative medicinal cannabis products are changing the lives of patients who suffer from several medical conditions that are unresponsive to other treatments. As we have seen in the previous paragraphs, the legal status of cannabis is full of technicalities. This is true whether we refer to the Italian one, which we have been able to ascertain from the laws we have analysed, and also when it comes to other states of Europe and the world. The first interventions on which to put pressure in Italy is regulation and the psychological aspects, that should go hand in hand with the other. However, in the past years, we saw a more shared willingness to open towards the cultivation of this plant for all its uses. For this paragraph, in particular, it would have been very interesting to be able to make a comparison between Rovigo and a province or a city of more or less the same demographic and economic size. Unfortunately, there is a lack of data and information at the local level, which, conversely, we find at a broader level, as the regional or national one. In this regard, I will report some cases that have seen an opening towards therapeutic hemp cultivation and administration, that led to its diffusion, and contributed to the development of the territory in question.

4.1. Yeruham, Israel

Among the first realities worth mentioning, we find that of Israel. Israel is mainly arid and desert but the west, parallel to the coast, presents a fertile and water-rich plain, where 70% of the population is settled. Israel developed various water savings technologies, including drop irrigation, due its widespread scarcity of water. An abundant insolation has instead pushed Israel to exploit solar energy, whose per capita production is first in the world. The obstacles it faced, and has yet to face, did not

prevent it from establishing itself as the most economically advanced and dynamic country of the Near East.[149]

This dynamism made the territory an attractive area for scientific and technological research. Thus, not by chance, the man who started the modern medical movement for cannabis hails from here. Dr Raphael Mechoulam is an Israeli researcher, famous because he spent his entire life studying cannabis properties and overall because he was the first man who isolated THC in 1964. His results indicated incredible psychoactive and medicinal potential of this single plant. Then, 20 years later, he found that THC interacts with the vastest receptor system in the human body, the endocannabinoid system. This chemical bond unleashes several reactions that can cause different effects, from anti-inflammatory benefits to paranoia. In 1992, he found out that the human brain produces its cannabinoid, which has been called anandamide.[150] Anandamide carries out its synthesis in areas of the brain where memory, motivation, superior cognitive processes and movement control are managed. So far, even if the functioning of anandamide has not been completely understood, its importance for physiology is evident. It can influence and interact with the receptors of our bodies, just like some cannabinoids in the cannabis plant.[151] It is perceptible that such results are of extreme relevance to the scientific and medical world. They have put a solid basis for future developments in the research of the features of this plant. Given its potential, we should not stop at the available information, but we should use it to improve its progress.

By the time when Mechoulam was doing his experiments in Israel, scientific research on cannabis was slow. The political climate considered cannabis still a taboo, and this had direct consequences on the possibility of researchers finding hemp to conduct studies.[152] However, in the last years of the past century, thanks to the studies conducted by Mechoulam and the reached results, things started to change. Since 1995, the Israeli Ministry of Health accepted to start using this plant to help overcome certain diseases, and has been promoting medical cannabis as an alternative to traditional medicine.[153] In 2008, the Israeli government started medical evidence of cannabis on soldiers. In 2014,

[149] Israele nell'Enciclopedia Treccani
[150] Raphael Mechoulam: "Endocannabinoidi coinvolti nella maggior parte delle patologie umane" - Cannabis Terapeutica Cannabis Terapeutica
[151] Anandamide, sistema endocannabinoide e felicità (enecta.it)
[152] https://blog.enecta.it/raphael-mechoulam-lo-scienziato-pioniere-della-ricerca-sulla-cannabis
[153] https://fondazioneisal.it/terapia-del-dolore-cronico/cannabis-terapeutica-israele-ne-facilita-il-consumo/

another step forward was taken thanks to 15 Israeli families with sick children who threatened to emigrate to Colorado if the State did not change the law on medical cannabis.[154] Nowadays, the regula of the medical cannabis field in Israel is the first of its kind in the world.[155] In December 2021, there were 109,352 active medical patients in Israel, about 35% higher than one year earlier.[156] This demonstrated the efficacy of the medicine and, at the same time, the Israeli competence to build such businesses.

In this political and economic context, a project on the cultivation of therapeutic cannabis has recently been promoted. It happened in the Israeli Negev desert, a completely different landscape from the skyscrapers of Tel Aviv, in the city of Yeruham. The final aim is to create an international reputation as a technological powerhouse in medical cannabis. Indeed, dozens of start-ups are already active in this field in Israel, also thanks to the new legislation expected to lead to further market growth in this rapidly expanding sector. And even though the recreational use of cannabis is illegal, it is tolerated. Authorities have encouraged its therapeutic use for the past decade, to treat severe medical conditions and post-traumatic stress in former soldiers and others. The company that put the initial effertos in Yeruham is called CanNegev. It is known as an incubator, which means that it helps upgrade nascent businesses. CanNegev is the promoter of four start-ups and is the first of its kind related to medical cannabis technologies in Israel. The decision to set up such activity in this place, was taken by Zvi Bet Or, CanNegev founder. He found in Tal Ohana, in 2018, nominated as the first female major in Yeruham, the perfect partner to set this kind of project. Precisely, she was aspiring to make this city the capital of medical cannabis and invest in avant-garde science and technology of this field. Further support arises from the fact that Yeruham is part of an economic priority zone, which permits to offer concessions to firms willing to set up here. The combination of these factors makes us assume that cannabis could help the territory to tackle unemployment among its 12,000 residents, which now is around 8%.[157]

Another factor contributing to the creation of this project is the recent approval in October 2021 by the Knesset, the single-chamber parliament of Israel, of a preliminary

[154] Stato giuridico della marijuana in Israele - CannaConnection
[155] https://www.cannaconnection.it/blog/14763-stato-legale-israele
[156] https://mjbizdaily.com/israel-experiences-another-disruption-to-cannabis-shipments-report-says/
[157] https://www.timesofisrael.com/desert-town-yeruham-aims-for-employment-high-as-israels-medical-cannabis-capital/

bill to make medical cannabis more available. The new regulations aim at overcoming a chronic shortage of medical cannabis available, due to strict regulation over producers, to those with a prescription. The Health Minister himself affirmed that it is time to release this matter, tied for years to unnecessary bureaucratic restrictions. Real reform needs to be applied to free up the use of cannabis.[158] This law would expand a market that has already attracted dozens of entrepreneurs. About 100 start-ups are working on cannabis, adding that a quarter of these companies were founded in just one year, 2019. A pivotal factor in the development of the Israeli industry of cannabis has been imports from overseas, especially from Canada. According to data from the Health Ministry, Israel imported 22 tons of medical cannabis in 2021 compared to just over 14 tons the previous year, making it the world's largest importer. Conversely, exporting cannabis is legal, in theory, but faces significant obstacles in complying with international standards.[159]

Moreover, the Health Ministry recently indicated that it was also looking into the possibility of removing CBD from the list of dangerous drugs. The measure could open up a new market for companies to scale CBD-based products. In southern Israel, near the city of Ashdod, BOL Pharma grows 400,000 cannabis plants annually on 3.5 hectares, exclusively for therapeutic use.[160] BOL Pharma has been pioneering the creation of the medical cannabis industry in Israel since 2007. The company sources 99% pure pharma-grade CBD, THC, and other active ingredients from its organic GAP-certified growing facilities and cGMP-certified production plant. BOL serves thousands of patients, physicians, HMOs, and medical centres, in collaboration with the Israeli Ministry of Health and under governmental license, providing cannabis-based medical products and cannabinoid-active pharmaceutical ingredients (APIs).[161] The company, currently the largest in the medical cannabis field in Israel, has also partnered with CanNegev and supplies it with cannabis flowers for scientific experiments. In its drive to become Israel's centre for "green gold," the municipality of Yeruham has already set

[158] https://www.timesofisrael.com/knesset-gives-preliminary-okay-to-bill-to-make-medical-cannabis-more-available/
[159] https://www.france24.com/en/live-news/20220206-israeli-desert-town-aims-to-be-medical-cannabis-capital
[160] https://it.euronews.com/2022/02/06/israele-nel-deserto-del-negev-sta-nascendo-la-capitale-della-cannabis-medica
[161] https://medcansupport.co.uk/service/bolpharma/

aside 50 hectares for medical cannabis cultivation.[162] The user of that plot has not yet been determined, but the mayor stated that agreements have also been reached for two factories manufacturing non-medical cannabis, that could be set up in Yeruham in the coming years to create new jobs in the territory.[163]

The case of Israel is a fundamental example and demonstrates the outcomes that the cultivation of this plant could produce from a local development perspective. The limit is the legislation, indeed, there is the desire of investing in these businesses. And this is what is missing in the national and regional context in Italy as well. Hemp, especially with THC, is still often criticised for political and ideological reasons. In a desert city like Yeruham, what has been encountered is an open mentality and interest in science, technology and development. Even if the project is still at the beginning, it has been a success in the implementation itself. Furthermore, I will present evidence from other examples too, to illustrate how the prospects of investments in therapeutical cannabis are positive and premise well.

4.2. Victoria, Australia

Another area where medicinal hemp is widely spreading is in Australia, where therapeutic cannabis became legal in 2016, when the federal government presented a list of legislative changes. The Australian Health Minister published new legislation that grants patients with chronic pathologies or pains permission to treat their symptoms using imported medicinal cannabis. Since there was no internal market that produced the medicine, therefore, they were forced to import it from abroad. In February 2017, the Australian Ministry of Health announced new projects to stimulate production at the local level, and the Federal Government also approved a new law that allows international companies to import and keep higher quantities of cannabis within the country, to facilitate its access.[164]

To obtain admission to therapeutic hemp cures, patients must have a letter written by their generic doctor, who confirms its need for therapeutic purposes. Indeed, medicinal

[162] https://www.timesofisrael.com/desert-town-yeruham-aims-for-employment-high-as-israels-medical-cannabis-capital/
[163] https://www.france24.com/en/live-news/20220206-israeli-desert-town-aims-to-be-medical-cannabis-capital
[164] Status giudirico della Marijuana in Australia - CannaConnection

cannabis is not a quick fix or a cure-for-all, but it is an evidence-based treatment that considers the patient condition and circumstances. For this reason, its products are prescription medicines, and the Therapeutic Goods Administration (TGA) regulates its supply. The medical conditions that constitute valid requirements to access the therapy vary according to the state and can affect whether someone can get it or not.[165]

To be more specific, I will concentrate the information on one Australian region, Victoria, the second smallest State in Australia, with a land area of 227,444 km². Even if we understand that a comparison with the province of Rovigo is audacious, the project in this area shows very interesting data, that we can use comprehend whether the therapeutic hemp market is developing. It helps in understanding the means, competencies, investments, and legislation necessary to implement such project, and the implications that it has on the development of the territory.

In Victoria, all stages of the process from cultivation to manufacturing, distribution and patient access, are tightly regulated, principally by the Commonwealth Government, to ensure that medicinal cannabis products of a reliable quality are available to patients who need them most. As the industry develops over the coming years, legislation is expected to evolve too. Victoria's first legal crop of cannabis was harvested by the Victorian Government for medicinal use, making Victoria the first State in Australia to produce medicinal cannabis locally. To date, global exporters of medicinal cannabis have been confined to the Netherlands, United Kingdom, United States and Canada. These suppliers have emerged in large part because of a supportive policy environment. But, with the announcement that Australia will establish an export market, Victoria is well positioned to supply products to patients around the world. In 2018, they started this plan that aims to guide the development of the Victorian medicinal cannabis industry from its emerging status to that of an established industry that is ready to supply both a domestic and international market. This vision includes Victorian firms producing-high quality medicinal cannabis products for domestic and global patients, establishing Victoria as an export hub. This new competitive industry will contribute to the productivity of the state, and the creation of new jobs along the industry's supply chain and in the cross-sectors. Medicinal cannabis will be cultivated, manufactured, and distributed in a competitive marketplace by licensed companies that will make possible

[165] Medicinal cannabis | healthdirect

the creation of more employment. Cultivation will occur in secure and tightly controlled environments, and all stages of the supply chain will be subject to strict regulations. To ensure that Australia's products meet the highest standards of quality and reliability, Good Manufacturing Practice will be applied to the processes. Also, distribution will be under rigorous management, happening through licensed pharmacists to patients with a prescription from a medical practitioner, similar to the process of other medicines and pharmaceutical products. Both quality plant-based products and pharmaceutical-grade products will be available to patients in a range of formulations, ensuring that Australia's products meet the diverse range of needs of Australian and overseas patients. By 2028, if Victorian producers meet the needs of 83,000 Australian patients and develop a strong foothold in key export markets, the expected outcome is that the industry's economic contribution to the state could reach $90 million per year.[166]

In 2018, the Victorian Government released its four-year Medicinal Cannabis Development Plan, outlining eight leading actions for government to facilitate the development of new medicinal cannabis products.[167] The first one, concerns the promotion of collaboration and networking between key stakeholders. It is shared knowledge that making connections helps in creating a shared understanding of challenges, resulting, in turn, in the development of better products and increasing confidence in all the activities, in our case, related to therapeutic cannabis. To make an immediate comparison with our country, this is one of the biggest lacks that we find in the Italian context, where there is not a network of hemp enterprises and where there is no coherent legislation to support such businesses. As a second point, the Victorian Government aimed to reduce inefficiencies created by complex regulations. Streamlining Commonwealth and state legislation could avoid duplication of processes that would require both bodies' approval, implying a simplification of the system. One more action that could contribute to the improvement of the system, is the development and dissemination of clinical guidance and education materials for medical practitioners, pharmacists and health professionals to ensure that these are consistent with the legislation. To protect these instructions, the Government should elaborate a scheme able to guarantee a license of intellectual property. This would allow companies

[166] Industry Development Plan: Developing a Medicinal Cannabis Industry in Victoria, 2018–2021 Published by Agriculture Victoria, Department of Economic Development, Jobs, Transport and Resources

[167] Medicinal Cannabis in Victoria | Jobs, Precincts and Regions (djpr.vic.gov.au)

to operate competitively within the sector regarding strains of therapeutical cannabis, attracting both domestic and overseas industry investments. About this last aspect, it is also crucial to determine principal relationships in the existing pharmaceutical or agricultural supply chains that could be leveraged for the exports of medicinal hemp products. Victoria could become a hub of this business, leading to the creation of additional jobs in the state. A meeting position between many of the points just listed, is the setting up of an online one-stop-shop for industries, doctors and patients where they could all have easy access to relevant information, regulations and requirements of many kinds. To have only one source to consult would increase awareness about regulations for companies and investors and also facilitate patients' access to knowledge. It would simplify the research on therapeutic cannabis, saving time for everyone who wants to use it.

The seventh action aimed to support clinical trials, generating evidence to inform medical practitioners, health professionals, the government and the public about the use of medicinal cannabis to treat a range of conditions. This would lead to an improvement in the accuracy of the dosages, increasing practitioner confidence in new products and in the industry itself.

Last, there will be facilitated access to an appropriate labour force, encompassing experienced local and international staff. This will happen, for example, by identifying potential companies in the medicinal cannabis sector for partnership and sponsorship, promoting and training new entries like smaller companies, and working with the industry to advocate the Federal Government on skilled occupations needed to support industry growth, increasing the development of agricultural R&D and creating new local jobs.[168]

Starting from the launch of this plan, it demonstrated many signs of progress. According to the Deloitte[169] report published in 2020, between the period 2017-2019, the medicinal cannabis industry in Australia has experienced rapid growth, especially concerning to Victorian production capacity and supply, patient cohorts and export opportunities.

[168] Industry Development Plan: Developing a Medicinal Cannabis Industry in Victoria, 2018–2021 Published by Agriculture Victoria, Department of Economic Development, Jobs, Transport and Resources

[169] Offices leading audit and assurance, consulting, financial advisory, risk advisory, tax, and technology services.

During these years, domestic demand has increased significantly due to improvements in the process of patient access. In Australia, and not only, access to medicinal cannabis is more complex than other medicinal products. However, thanks to the Industry Development Plan, the Special Access Scheme B (SAS-B) has been streamlined by the TGA, through the introduction of the online portal that made the application process much simpler, cutting the waiting times. The direct consequence was a great increase in the demand, demonstrating that this can be limited due to a lack of knowledge and understanding of therapeutical cannabis indications and prescriptions. Nevertheless, we should keep in mind that the high prices of the product and the lack of transparency related to it, make it a challenge both for patients and clinicians. At present, patients must cover the entire cost of their prescription as there is no standardised subsidy available for medicinal cannabis. Deloitte also indicated it is unlikely that medicinal cannabis will be listed on the Pharmaceutical Benefits Scheme (PBS) shortly. It means that the price is likely to remain relatively unaffordable for many patients compared to alternative treatments for an indication listed on the PBS. On the other side, current exports remain small because high-consumption countries, for example, Canada and Israel, already have relatively well-established local production. In a future scenario, Victoria could see an extensive opportunity in the European market, where Italy is one among the preferences, and where there is already high competition. Therefore, the potential size of this export chance is still undetermined.[170]

Given this information, the same report also mentions some scenarios for development of the industry in the future. The focus is on the possible volume of domestic production and revenue, in response to patient demand and supply to export markets, by 2028. To calculate Australian patient demand, they used a bottom-up approach considering 13 indications for which therapeutical cannabis would be a suggested treatment. The result is around 242.000 patients, for which the Victoria production will cover just a part, involving other Australian States or international imports for the remaining portion. Reflecting on all uncertainties mentioned before, they outlined three possible scenarios of development: a lower bound scenario, a medium scenario and an upper limit scenario. Of these, the medium one, results to be the most realistic future for the industry in Victoria, and it is the only one that I will deepen in this thesis. In this

[170] Medicinal Cannabis: Industry development modelling, Summary Report, Agriculture Victoria, Department of Jobs, Precincts and Regions, Deloitte, 2019

scenario, Victorian producers are expected to supply 41% of the Australian market for medicinal cannabis. Under this assumption, medicinal cannabis products would serve the demands of approximately 300,000 patients by providing 233,754 litres of therapeutic cannabis oil (74,585 kilograms of dried plant matter). Of these patients, approximately 99,173 would be Australian, demanding 74,585 litres of oil. Exports also occur in this scenario and represent two-thirds of Victorian production of medicinal cannabis, reflecting the current share of exports across agriculture more broadly in Australia. The economic contribution modelling of this framework demonstrates that the medicinal cannabis sector could supply $365 million, of which $233 would be direct and $132 indirect. It is also estimated that the industry employment could reach 750 employees, mostly as manufacturers, cultivators, and technicians of a different kinds. To support this emerging industry and to achieve these results in Victoria, the Victorian Government should seek some recommended actions: maintain quality standards; focus on industry efficiency; support evidence collection through clinical trials; promote export opportunities through the medicinal cannabis industry associations; undertake more research and modelling of domestic and global markets; simplify the process for the medical industry to become aware of the efficacy and price of local products; ensure local products are price competitive and can be supplied to pharmacies; continue to research plant strains, strengthen the provision of advice to industry.[171]

To conclude, this second example brought additional details in comparison with the Israel project and context. The results were presented with a greater quantity of evidence, making it an excellent strategy of inspiration. The next section will add further encouragement.

4.3. United States, America

In 2021, has been published an intriguing review article about the opportunities and challenges for localities from cannabis legalization in the U.S. From the Marijuana Tax Act, there has been a prohibition to trade, use and cultivation of hemp in the U.S. From Controlled Substances Act of 1970, there have been many changes. The rate of American adults supporting legalization has climbed steadily over time, from 12% in

[171] Medicinal Cannabis: Industry development modelling, Summary Report, Agriculture Victoria, Department of Jobs, Precincts and Regions, Deloitte, 2019

1969, 30% in 2000, more than 50% just a decade later, and nearly 70% in 2020. Today thirty-six U.S. states allow cannabis usage and cultivation for medical or recreational purposes, despite its federal illegality. This disconnection produces a range of consequences undergirded by uncertainty and risk. However, federal prosecution for cannabis crimes declined notably in 2018 and 2019, even if likely due to limited enforcement resources. Notwithstanding this study brought many examples about recreational cannabis, I will transfer, where and if possible, these considerations on therapeutic cannabis only. The following notions will explain why this business should be supported to create opportunities for local developments. Among the very first ones, there are economic benefits. The cannabis industry is growing more and more, increasing its monetary impact in the world, and local governments could take advantage of it, excising revenues. These could be used for public park maintenance, education, schooling, job training, policing, and health interventions. To provide some examples, in California, a portion of state cannabis tax revenues go to communities disproportionately affected by past drug policies; in Santa Cruz, they help fund the county's nurse-family partnership programs; in Washington, they support public education and public health interventions. The challenge is to find the best tax rate, if too high, they could encourage buyers to go to illicit markets.

Since much government expenditures are today spent to control criminal justice, cannabis legalization could reduce these costs and lead to savings. Another crucial economic benefit, is the expansion of the business to all the connected sectors. Agriculture could have a growth in the demand for cultivable land, in sales of farm supplies, generators, soil, and hardware, and there could be more investments in technology and research. There would be also growth in professional services, packaging, equipment sales and maintenance, security, and as a consequence building or fixing infrastructures, creating new jobs in different fields. Then, if more people are working, there will be a development of the service sector, once again contributing to the welfare of local economies, especially if workers are hired locally.

The second broad advantage are public health and safety improvements. Indeed, legalizing jurisdictions typically develop regulations for cultivation, sale, and use. As a consequence, there would be safer access to the products, assuring their better quality and properties. In addition, it has been already proved that therapeutic hemp is an optimal opium substitute. This is particularly compelling given that state and local

governments regularly spend more than $8 billion annually on criminal justice activities related to opioid abuse, dependence, and overdose. Cannabis legalization may increase police effectiveness, devoting its resources to more serious and urgent crimes than cannabis.

Besides, the same review article reports cannabis industry challenges. We can mention the uncertainty in the economic gains because of the high costs of technologies for transfromation, economically disadvantaged individuals may be unable to participate in the legal market, producing inequalities, regulations could be ambiguous and overlapping at different government levels, and the agriculture expansion should be done in specific environment sustainable limits (considering both indoor and outdoor farming).

This industry needs to be investigated and studied deeper to have more secure and reliable data. But we can use these results to learn from experiences, and prepare similar development plans. Thanks to existing examples, it becomes easier to have a point of reference from where to start its own business. Local governments should applicate tools in the local governance toolkit like land use controls, controls that flow from the jurisdiction's police powers, taxation, and programs that direct money from the cannabis industry to local priorities.[172]

4.4. Lesotho, Africa

The last example I will report is a study that has been conducted by the International Labour Organization (ILO) in underdeveloped areas. Some developing countries, in particular those negatively affected by the decline of tobacco exports, have seen a growth opportunity for their economies in the cultivation of cannabis and the production of cannabis-derived pharmaceuticals. The research intent was to understand the difference that medical cannabis could make for poor countries in terms of growth, and it was conducted in Lesotho and Zimbabwe. Specifically, they wanted to see if the industry of medicinal cannabis would have created new jobs at a local level. Even if the outcome of the report was not satisfactory from this perspective, it remains interesting

[172] Kavousi, P., et al, What do we know about opportunities and challenges for localities from Cannabis legalization?, Review of Policy Research, 39, 143– 169, https://doi.org/10.1111/ropr.12460

analysing it. Moreover, it is also important to outline the difficulties that such a project could encounter, and thus learn from them.

Since the industry is at a more advanced stage of development in Lesotho and most of the data are drawn from that country, we will bring our attention only there.[173] Lesotho was the very first country in Africa to grant licences for the production of medical cannabis, in 2017, hoping that this would help in financing infrastructures expenses of a different kind. The government signed agreements for tens of millions of dollars with foreign investors. This sector is increasingly profitable to develop in Africa, thanks to the low production costs. The largest cannabis manufacturer in the small country in southern Africa is MG Health, which received a $ 7,6 million contract from the Canadian Supreme Cannabis society in 2018. With the proceeds derived from cannabis, the government hoped to create new jobs.[174] However, the results of the study conducted claimed that only very few informal small-scale cannabis growers are formally recruited by medical cannabis companies. Another negative aspect of the new industry is that land, that would otherwise have been used by poor indigenous farmers to grow maize and tobacco, is being taken away from them and assigned to the new medical cannabis enterprises. It should have given more importance to the establishment of linkages with local enterprises, by forcing foreign manufacturers to hire local workers. The emerging industry is completely disconnected from local level. New employment opportunities could have arisen, for example, in low-skill activities, such as pruning, irrigating, harvesting and drying. But this didn't happen and occupation almost didn't see any improvement, although the fact that those in cannabis manufactures are jobs that offer relatively decent working conditions. An additional intervention that local governments should do, is in areas like communications, information technology, and electricity. This is because, at present, only companies benefiting from foreign investments can afford the facilities needed for this business, like solar panels and satellite connections. This could be solved by providing a higher transfer of knowledge between international and local enterprises, and increasing the level of funding for research and development. Specializing in sophisticated products like pharmaceuticals is a crucial challenge for poor countries and, if successful, it can be

[173] De Gobbi M. S., Exploring decent work in the pharmaceutical industry, Job creation in the production of medical cannabis in Lesotho and Zimbabwe, International Labour Office, Geneva, 2022
[174] Lesotho. Cannabis: il presidente Thabane punta a nuovi posti di lavoro | Notizie Geopolitiche

extremely rewarding for their development. To promote the business related to therapeutic cannabis, proper incentives could be granted to enterprises that are involved in activities linked with this industry.[175]

Thanks to this example we were able to see what are the demanding tasks that a country could deal with. The creation of partnerships, building social networks, increasing investments, focusing on research, diffusing knowledge, construction of infrastructures and provisions of facilities. It all requires time, money, possibility, and willingness. And if we find this much interest in poorer country, we understand that also in Rovigo, there could be a stronger effort.

Considering the examples presented and some additional information provided during some interviews, the coming chapter will bring a practical plan of the development of a supply chain for therapeutic hemp industry.

[175] De Gobbi M. S., Exploring decent work in the pharmaceutical industry, Job creation in the production of medical cannabis in Lesotho and Zimbabwe, International Labour Office, Geneva, 2022

5. The investment in an industrial strategic plan

The production structure of Rovigo highlighted an economy emerging from a crisis with a high degree of disadvantage. The principal reasons are the lack of strategic development of some important assets, and the inadequate territorial response to the structural shock caused by changes in world demand. The enhancement of local resources and the creation of a territorial economic advantage require a strategic investment in new local connections capable of generating new production chains. If we consider the historical propensity of the territory towards the cultivation of hemp and the presence of a nationally recognized centre for studies on medical cannabis, the CREA, we realize that the establishment of a medicinal cannabis business could be a reasonable investment. Adopting a strategic industrial plan linked to the production of cannabis could lead to development of the territory both from an economic and social point of view, improving the indicators analysed in *chapter 3*.

This growing interest in the medical use of cannabis highlights an expanding worldwide demand and an escalating market. Based on world trade trends, it is possible to estimate, in general terms, the optimal production size for the Rovigo area. In particular, to define the study of an industrial plan to create a cannabis production chain in Rovigo, it is necessary to analyse some specific elements. Among these, we find supply and demand analysis, production structure, revenues and labour market, innovation and the development scenarios for Rovigo area.

With the contribution of my supervisor, Professor Francesca Gambarotto, a professor from the Department of Agriculture of the University of Padua, Stefano Bona, and PhD student, Maddalena Cappello Fusaro, I was able to estimate some of the values of these sections and get an idea of a strategic industrial plan concerning the cultivation of medical cannabis.

Therapeutic hemp should be cultivated indoors. We can imagine a barn with total area of 1000 m², composed of smaller rooms. The area 1 corresponds to the room of the "mother plants", from which the cuttings are removed and placed in area 2, where they are left to grow for 4 weeks. At the end of these 4 weeks, the plants are brought to room 3, where they remain for other 8 weeks until flowering. Room 3 and 4 are larger than the number 2 because here plants need to have more space to get bigger and produce

more flowers. In the meantime, other plants were taken to room 2 and left there for 4 weeks, and then transferred to room 4. At the end of each cycle (one cycle is composed of 8 weeks) of rooms 3 and 4, the plants are cut and moved into room 5. Here they are subjected to rough cleaning and it is where the leaves, the stems and the roots are discarded. This modality enables the creation of a production circuit, thanks to which the two large rooms can make 6 cycles. The next step is room 6, the Good Manufacturing Practices room, where the quality control of the product takes place and where it is crumbled and prepared to be sent to pharmacies or extraction units. Thus, the data and information that will be presented in the following paragraphs, will be based on this barn sample and its production characteristics.

5.1. Demand analysis

One of the first factors that needs to be analysed when designing a strategic project is the demand, which would help in calculating how much of the product is requested in the market. For our purposes, different methods could be used to make esteems. To estimate the potential demand, and therefore the market outlets for the production of Rovigo, the legislation on the subject of European and non-European countries and the current therapeutic consumption can be analysed. The demand estimation could use the methodology of the Marijuana Policy Group (USA). It is a market intelligence agency and policy design for government based on an input-output analysis, thanks to which it is possible to measure the prevalence of pathologies that can be treated with cannabis-based therapies, in order to estimate their potential demand. It is also possible to distinguish the direct effects of the legalization of cannabis and the secondary effects on the entire production chain, and the employment generated. But another estimate that can be made is based on the information we possess thanks to the call by Health Minister, that has just been closed, regarding the willingness of individuals to cultivate therapeutic cannabis (see point 2.2.1). The decree mentioned the necessity of a production capacity of 2500 kg nationwide. So, if we make a proportion by dividing this amount by the number of Italian population and multiplying it by the number of inhabitants of Rovigo province, it turns out that the province needs about 9.4 kg of therapeutic cannabis. This result is generalized and cannot be precise, but it takes into account that the diseases at the national level are more or less the same as we could find at the provincial level. In the coming sections we will see that two barns of the dimension of 1000 m² would be able to satisfy the national demand.

5.2. Offer analysis

To carry out an estimate of the offer analysis it is necessary to understand how many companies operate in this market, what are their characteristics, what are the characteristics the industry wants to adopt for its production, the methodologies, and the results it wants to achieve. This information is of strategic relevance as it defines the number of cultivation licenses and the optimal production size per grower. Therefore, from the analysis of the offer, it is possible to estimate the expected level of production in the Rovigo area.

At the moment, the only structure with permission to cultivate therapeutic hemp is the SCFM, which supplies itself with the inflorescences produced at the CREA of Rovigo. Till the normative does not change, and if we do not consider foreign industries, the national market has no competitors. On the assumption that the State would start to grant more permits for the cultivation of this plant, the offer could increase, even if it is likely that this would still remain a niche production. This industry, in fact, requires large investments, starting from the machinery and technologies needed for cultivation, for processing, and for the knowledge that the working personnel must possess.

Assuming to have one barn of 1000 m², we can calculate its productivity in terms of finished product in one year. Let's consider that each plant can produce about 80 grams of finished dry product. Each of the two large rooms (3 and 4), in each cycle, is capable of containing around 1,550 plants. Therefore, if we multiply the grams they produce on average, by the number of plants, by the number of total cycles, we have that in one year the barn can produce 1,488 kg of therapeutic cannabis. However, it must be taken into consideration that these are calculations based on a situation in which the risks are zero, and therefore when all processes are performed without interruptions. If, on the other hand, we consider a non-productivity risk rate of 20%, production at the end of the year corresponds to around 1,191 kg. The risks that can be encountered are mainly linked to the production cycle. If, for example, the ventilation or dehumidification system in room 2 would break, this would misalign the cycles of the other rooms, reducing their productivity. According to these calculations, two and a half warehouses could meet and exceed the cannabis production that is currently required in Italy.

The creation of a cannabis district will have positive effects on the labour market, sharing of know-how, and concentration of intermediate production inputs (like machinery, production services, and agencies of particular stages of production), which we will see in the next part.

5.3. Structure of production

To make its product, each industry needs a production organization such as structures, machinery, offices, and warehouses. For this reason, the business plan must highlight the technology to be used and the company's production capacity, like which products to buy. Once the production aspect has been defined and the objectives have been determined, it is necessary to identify the company's production capacity, thus the quantity of production that the entrepreneur wants to ensure.

The information I was able to find regarding this part is quite generic and refers only to the costs of the step of cultivation. In each of the three rooms where the cuttings of the plant are kept, there are in fact systems for ventilation, humidification, pumps for water rich in mineral salts, and the lighting system, which in a year have a total cost of around 2 million euros. These purchases would easily be amortized with the first-quarter production revenues. Then we should consider the costs of maintaining the structure, on which however it is more difficult to make a plan, especially if we think of the energy crisis in which we find ourselves in this moment of history.

We must realize that this type of business cannot be done by anyone. Basically, it should be a pharmaceutical company with permits to manage psychotropic substances and which owns a laboratory for galenic transformations. In addition to the economic availability, a know-how is in fact necessary.

5.4. Revenues and labour market

Based on open data made available by other states that have legalized the use of cannabis for therapeutic uses, it is possible to deduce the share that the medical cannabis market represents within the total market. Through comparison it is possible to estimate what the impact of production on the Italian market, profitability and job creation could be for the Rovigo area.

Still referring to our model, the creation of this shed would not require a lot of manpower. It has been calculated that 7 workers would be sufficient to follow the cultivation, harvesting and transformation checks phases, while the role of manager could be covered by 2 people. This estimate is limited to the workers within the structure, and not to the possible supply chain that would be created. The jobs that would be created for packaging, transport, marketing, and distribution to pharmacies should also be taken into consideration.

The incurrence of these expenses would once again be easily amortizable. The costs related to workers' salaries would be within 500,000 euros per year. If we assume that the inflorescence would be sold for around 4 euros per gram, the revenues from the sale of the finished product to pharmacies would be around 6 million a year. This price is naturally lower than the purchase price of therapeutic cannabis in pharmacies, where it can reach an average of 13 euros per gram.

Referring to the circularity properties of the plant, according to which it could be used in all its parts, the possibility of the birth of a real supply chain should not be excluded. In this case there would be further important considerations to make. First of all, it must be said that, when a plant is prepared for cultivation for therapeutic purposes, the properties of the other parts such as the stem, leaves or roots, do not have great value in comparison with the flowers. For this reason, at the moment, they represent waste that must be disposed by following specific rules, especially as regards the leaves, because they contain a THC percentage higher than 0.5%. In addition, the waste is full of water and consequently, to make any derivative product, it must first be dried. This process is costly and for the payoff it has so far not been considered worthwhile. In terms of weight, however, we would be talking about 300g of waste per plant, which could have another life. Some examples that we thought to be reasonable to invest in are the use of leaves to extract cannabinoids, the use of stems for the creation of insulating panels (green building) and roots in biogas digesters or for creating substrate to cultivate fungus and provide them nutrition.

5.5. Innovation and development scenarios

The development of a therapeutic hemp business would create high revenues, that could be invested in other projects. This industry cannot be settled by anyone, as it has to

satisfy some specific requirements. Moreover, nowadays, entrepreneurs are discouraged by the Italian political situation, since nobody would decide to put a big amount of money on a market rich in threats. Project plans, in general, consist in the drawing of a very detailed SWOT analysis that have to contemplate that variables could change rapidly. It is the starting point from which is mandatory to pass through, and without which expectations cannot be made. For this reason, to create a broad and exhaustive industrial strategic plan is a necessity. We have seen that the outcomes that we can have from this plant are numerous, and given its positive properties, it should come again in our local markets in the forms of all its derivatives.

Taking into consideration that an investor's interest could be very low for the transformation of waste elements, above all considering the great profit he could have from the quality material he produces. Precisely for this reason, it could make sense to create a supply chain that would involve other industries. If, at the beginning, the main investment would be in therapeutic cannabis, we have seen many other industries can be connected to it, and in turn generate demand, supply, work, earnings, and development.

The implementation of a therapeutic cannabis business in the province of Rovigo could bring a crucial economic advantage to the territory. It would increase provincial and regional GDP, becoming a point of reference also for foreign countries. Economic welfare could be matched with social development, causing an improvement of all the indicators we previously analysed, like birth rate, mortality rate, average age, migration index, educational level, employment, unemployment, revenues and so on. It could be the start of a more promising future for the province of Rovigo.

This declaration derives from an objective analysis, which comprehended the research of case studies and observational statistics data. By contrast, to understand if these results were shared or denied by people with familiarity in this field, I met with some of them.

6. Interviews analysis

To give a more complete overview of the research that I have conducted, I decided to make some interviews. This helped me to extrapolate information that were lacking, and to listen to opinions of people that are already working in this sector and have a great knowledge about it. The results were very interesting, mostly because the people with whom I had conversations, represent different roles in the society, and, thus, have different points of view. In particular, they were two professors, one researcher and one municipal councillor.

6.1. Lucia Bailoni

Lucia Bailoni is a professor and researcher at the Department of Comparative Biomedicine and Nutrition (BCA) at the University of Padua. Her study focuses on industrial hemp, rather than medical hemp, and specifically she coordinated a project named "Produce hemp in the food and agro-industrial chain". For this reason, our interview was centred in the observation of the difficulties and effects of this project. First, it is to mention the fact that she coordinated a project of national relevance, financed by the Rural Development Program for Veneto 2014-2020, whose aims is modernization of rural areas, the improvement of the competitiveness of companies and environmental sustainability in the region. It started in 2019 and it is now almost at its conclusion. Its purpose was to connect and create networks among the agricultural enterprises interested in cultivating hemp, with partners specialized in the scientific field of varietal research, food enhancement and transformation into a zootechnical field. As part of the partners, we find the Coldiretti of Rovigo, Coldiretti of Veneto, CREA-CI of Rovigo, the University of Padua and three farms, two in Rovigo, and one from Treviso, which deal with the cultivation of industrial hemp. The development of the project is divided into the reintroduction of this culture in the agricultural sphere of the Veneto plain, adapting its agronomic techniques and first processing processes, using the best varieties responding to the pedological and environmental characteristics and the purposes of the different final transformations of the product. Among the activities that have been performed, Bailoni ventured into the zootechnical experimentation of use of the products derived from hemp in the breeding of white meat calves, in order to test the nutritional value and the food quality of the meat obtained. She affirmed that the result is that the health of the animal itself has improved and the quality of the products

derived from them has more complete characteristics. It has been highlighted that hemp derivative food products (such as oil and flour) have a high nutritional value. This is valid not only for animals, but also for human nutrition (presence of a balanced omega 3-omega 6 relationship in fats, and of essential amino-acids in proteins), constituting real food supplements. These aspects that should be subject to greater knowledge and spread of general information in society. Other interesting outcomes of the project are improved seeds genetics, thanks to the research of CREA, and the creation of stronger local networks among hemp manufactures in the area of the project. To date, the research is completed but the documents are still being prepared with the final results, and they will be presented in the first months of next year. Therefore, although the project reported is not related to therapeutic hemp, the objectives achieved are important both in terms of research and experimentation but also in terms of territorial development and environmental sustainability. In fact, it is undoubtedly an innovative project that must not end here but must develop further insights from its results.

6.2. Gianpaolo Grassi

Gianpaolo Grassi was my second interviewee. He is an agronomist with over 40 years of experience at the research institute for industrial crops in Italy. In 1995 he started working with hemp, thanks to the first three-year program launched by MiPAAF, and in particular in the group that dealt with the genetic improvement of the plant. In 2000 he obtained the CBD, the CBG, and other cannabinoids, and subsequently recorded three other varieties of cannabis used for the production of seeds. Still, he did the first varieties of Italian medical cannabis and, among these, two are now used by the military Pharmaceutical Chemical Plant in Florence: the FM2 (titled 5-8% THC and 7-12% CBD) and the FM1 (titled At 13-20% THC and <1% CBD). Up to now, Dr Gianpaolo Grassi is in his second year of retirement, but far from tired of working with cannabis. Together with his son, in 2015, he gave birth to Canvasalus S.r.l., a research and development company, settled in Monselice (PD), with the aim of becoming a reference point in the world of hemp. It provides advice on various aspects concerning the varieties to be used according to the customer's needs, the most suitable cultivation methods, the processing methods to be carried out during the harvest, and carries out analyses of the quality and quantity of cannabinoids.

The interview was conducted inside one hemp greenhouse of Cavasalus, and was of great inspiration in helping to answer many questions of my research. It is not easy to understand if it is possible that the cultivation of therapeutic hemp in the territory of Rovigo, could lead to a development of the territory. It must take into consideration many variables. The first, which we have already seen several times, is the question of legislation and bureaucracy. As long as in Italy the law will not change, in favour of a cultivation and production of therapeutic hemp, it is difficult to imagine that some entrepreneurs decide to invest in a similar project, with diffused insecurities and legal dangers. The second reflection to be made is related to the entrepreneurs themselves and their capabilities. In 57, among companies and individuals, have applied to the call that was published in April 2022 (mentioned in point 2.2.1.), concerning the demonstration of interest in the cultivation of therapeutic hemp. This represents the widespread interest in this type of industry, although, unfortunately, the call has many limitations that make it difficult for "common" farmers to participate and to win. It is clear that the final purpose of the participants is a profit.

Furthermore, Italy is already behind compared to many European countries and to the world, therefore, it would not be easy to start a business in this market. In any case, being able to satisfy all national demand is an achievable goal that would bring many benefits, among which we have the economic savings from less imports. Another aspect, no less relevant, is that of competitiveness. If the market was saturated, product prices could descend, but the industry itself would become less profitable, and only the strongest could survive. It is sensible to think of keeping therapeutic hemp industry as a niche. In addition, since the normative is very strict for pharmaceutic products, it is necessary to follow some constraints, such as GMP, quality standards, and specific procedures that have high costs and cannot be sustained by every manufacture. To start a medicinal hemp supply chain, law permitting, adds Grassi, would not be necessary long timing. In fact, many companies already have the means and knowledge to do it, and within a year, hypothetically, they could start its implementation. But it is not even to be underestimated the difficulty in preparing a business plan going to evaluate the risks, opportunities, the budget, the stakeholders, the means to create this industry. If we think, for example, of the energy crisis in which we are now, a plan that has been done six months ago, to date, it would already be to be reviewed as the forecasts would probably not be any more valid. All these statements, if applied in the context of

Rovigo, according to Grassi, become even more complex. The only ones who would be able to start an industry transformation industry, are the pharmaceutical industries as they have the notions, the means, and money to do it. But it is not sure that they would consider Rovigo as the right territory where to open this industry. There are other cities and regions, especially those with autonomous statutes, that have more elasticity, means, and therefore more favourable conditions to start this business. What is missing,nationally, is the investment in research and development. Grassi himself in the past asked to create a spin off, but the request was rejected. This is a proof of the limits that therapeutic cannabis cultivation and transformation have to go through. In other states, as in America, Australia, and Europe, thanks to the spin offs, there is continuous research that brings innovation and development, both of companies and the territory.

6.3. Stefano Bona

The third interview was with Stefano Bona, professor at the Department of Agronomy, Food, Natural resources, Animals and Environment at the University of Padua. For several years he has been dealing with hemp. This year he kept a course on "Cannabinology: the cannabis plant and the endocannabinoid system", and awarded two scholarships on the "Management of hemp collection from seed" to students of his department. An additional stimulating reality that came out from the interview, was the fact that he just obtained authorization to cultivate medical cannabis for research purposes at the University of Padua, in the Agripolis site. The most difficult part, affirms Bona, was to obtain permission from the Ministry of Defence and the Ministry of Health, that took 2 years. If it is so difficult to get a permit for a university that wants to do research, we can imagine how complicated this could be for a farmer or other businesses. Moreover, going to deny what Grassi said about politics, Professor Bona reminds me that in the past there have been politicians who were part of parties that were generally against cannabis but who, at the end, became spokespersons for projects that concerned this plant and its uses. With a more optimistic perspective, therefore, he is counting on the fact that the Government that has just come to power will not necessarily maintain a total closure against hemp, but there could be good developments in the matter, which now is not even expected.

The other fundamental contribution he gave were the information about the project for the construction of a barn for the cultivation of therapeutic hemp that we examined in

the previous chapter. According to that project, to have a good income, it would make sense to declare the city of Rovigo the only centre for the production of therapeutic cannabis, at least initially. However, if the legislation does not change quickly, it would be reasonable to try to invest in the production of industrial cannabis for CBD extraction. This business for now is much easier and has a very high productivity. Cultivation can be done outdoors and in large fields, probably using even more manpower, as well as different machinery and technologies. This last declaration is shared also by the last interviewee, Dina Merlo.

6.4. Dina Merlo

Dina Merlo is an agronomist with a teaching background, and since 2019 she has been assessor of the environment of the municipality of Rovigo. For several years she has been dealing with the issue of hemp, both industrial and therapeutic, and proves to be proactive and optimistic about the future of this plant in the Rovigo area. Together with Professor Bailoni, she was a member of the Territorial Strategic Plan "Produce hemp in the food and agro-industrial chain", which is ending in current weeks. She mentioned that the project was satisfying and brought important results that should not end here. To deepen all the realities connected with this plant, the State should invest more in research and development practices. The trade associations of Rovigo, like Coldiretti, show an interest in these cultivations. However, current legislation is limiting, and according to Dina Merlo it would be appropriate to build separate regulatory frameworks between therapeutic cannabis and industrial cannabis. A request to move down this path should first of all come from doctors, who could carry out more experimentation, if there was more product available, and thus create a historical availability of documentation relating to trial studies. Another important challenge concerns the lack of awareness linked to the many properties of this plant, that are often reduced to clichés. To deal with this problem, the population should get more involved, and more information should be disseminated on the uses deriving from the plant, clarifying its industrial and therapeutic characteristics, and also the latest discoveries of its nutritional values.

The assessor declares that the territory of Rovigo would need new companies. They could be linked to industrial hemp, which results in the diffusion of a new crop and a new market, but also to therapeutic hemp, that would acquire added value from the

transformation processes. The other option would be continuing to enhance CREA, pursuing essential results for research and development. As mentioned by Grassi, Dr. Merlo confirms that the presence of pharmaceutical industries is necessary because the two realities are directly connected: However, in her opinion, it cannot be excluded that a well-competent farmer would be able to arrange the necessary cultivation chambers.

Finally, an important issue to be developed would be to give general indications on the setting of the work and the various phases to be followed from harvesting to transformation in order to obtain an accepted final product that respects the required characteristics. At the moment we find ourselves in a transitory situation, evidenced by Professor Bona's obtaining the right to cultivate hemp with THC for research at Agripolis, and by the State tender on the production of therapeutic hemp, in which, however, the SCFM plays a central role. However, if these outcomes became a starting point for creating other production and processing industries, it would carry important development and innovation at a local, but also national, level as new manufacturing centres could diffuse throughout Italy.

7. Conclusions

My thesis aimed to identify the possibility of development for the territory of Rovigo if it would invest in the therapeutic cannabis industry. Based on the quantitative and qualitative data presented, it can be assumed that this investment would have a positive impact but has to face a few problems, mostly related to politics and consciousness.

The interest in this field is notably growing, and many countries are already obtaining relevant outcomes. Italy, on the other side, is being left behind because of its slow legislation and bureaucratic contradictions. As we have observed in the case studies presented in Israel, Australia, USA, and Lesotho, there is not one project that is suitable for all. Each state has to take into consideration its strengths and weaknesses, and elaborate a detailed and tailored plan. But thanks to the existence of numerous examples, Italy could be advantaged in the strategy delineation process. As long as the State decides to keep the question of cannabis so unfavourable, it keeps losing precious resources that could be spent in the improvement of public projects. In a non-legalized world, in fact, there is no control, and this ends up belonging to the world of mafias, increasing their revenues and authority. Incentivizing the black market clearly subtracts money that could enter the state, through taxes and research investments. In addition, the quality of the illegal product is almost always poor, and consequently dangerous for those who use it. Furthermore, of that little therapeutic cannabis which is legally sold in pharmacies it is too little and has very high costs. The fact that patients are deprived of the right that would make their lives more endured, should not be any more accepted. If the offer grew, prices would become more accessible and there is a high chance that the demand would increase too. The processes related to the cultivation, transformation, marketing and use of therapeutic hemp, should have a specific disciplinary establishing safety quality standard. This would contribute to the creation of networks among researchers, farmers, entrepreneurs, and other workers. The consequence would be the increase in the collaboration in predetermined forms and areas, the exchange of information or performances of industrial, commercial, technical or technological nature, and the common exercise of one or more activities falling within the subject of one's business. By combining the forces, it is possible to achieve objectives that alone companies would not be able to achieve.

The settlement of a therapeutic cannabis industry in Rovigo, could be the starting point for a series of beneficial effects. Its territory embodies a disadvantaged reality because of its socio-economic condition, but with a good potential. Even if the area results not favourable for entrepreneurs due to its static situation, the presence of CREA could represent an opportunity for the development of more dynamicity. Due to its role in the Italian cannabis production, the research centre should be more valued and the territory could give it more attention. Governments should become aware of the decisive impact that investments on hemp could generate, and give more trust to this growing industry. From the description of the productivity of a therapeutic hemp barn, it was ascertained that the company that would produce the flowers, would have a remarkable revenue. However, to satisfy the national demand, numerous structures with a lot of staff may not be necessary. For this reason, and for the fact that other products can derive from flower production waste, the necessity to broad this manufacturing is assured. It is sensible to think of creating an industrial plan able to take advantage of the plant's characteristics. It would create new jobs, bringing local higher incomes that could support the necessary public interventions to improve the demographic indicators that we previously analysed, especially those regarding education and health. The improvement of education would bring a higher propensity for technology and innovation, raising the national and international reputation of Rovigo.

However, the first action to perform would be the change of legislation. Following this, to better understand the implications of the illustrated results, future studies could address the implementation of this strategic plan. Further research should be made in this field, to have a broader knowledge of the potential of this plant, botanically, environmentally, socially, and economically speaking. Moreover, communication and information should also be a big part of the efforts, because it could bring a transformation in the opinion of society. Society represents the level where to start to request a change, and until it see it as a plant with a dangerous and unknown properties, there cannot be a revolution.

8. References

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